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House Warming

Strong Reasons for Using Electricity

SOME measure of the importance of the use of heat in dwellings is that, directly or indirectly and including cooking and water heating, it accounts for about a third of the consumption of coal in this country. Nevertheless the prevailing low standard of warmth ought to be improved in the interest of health and reasonable comfort. That must be done without materially trenching on the restricted reserves of fuel having those characteristics that are needed for industrial processes.

Widely-Varying Conditions

To reconcile these opposing requirements was a principle task of the Committee responsible for the Report on Heating and Ventilation, some particulars of which are given in this issue. Many of the shortcomings are due to the misapplication of heat. So varied are the conditions to be met that the Committee comes to the conclusion that there is no single answer to the question of what is the best system. Taking things as they are to-day that is doubtless correct. On a long-term view, however, the Report in its analysis of national fuel resources, theoretical thermal requirements and practicable applications of heat contains implications that point to an ultimate simplification of the issue through electrification.

Different types of fuel, it is urged, should be used only for the purposes for which they are most suited. It is shown that the generation of electricity provides a large outlet for otherwise almost unmarketable coal, thus helping to utilise the whole of the fuel resources of the nation. A major difficulty in standardising any particular form of heat appliances the Committee finds in the varying nature of coal, throughout the country, so that a system efficient in one locality may not be so in another. But electric power stations can be designed to deal with any class of fuel and turn it into one consistent product whose efficiency in use does not depend upon frequent adjustments to maintain test figures. Through grid interconnection the effect of irregularities in fuel supplies is ironed out. In addition, precautions against atmospheric pollution successfully adopted in power stations would, as the Report shows, very materially reduce atmospheric pollution if all residences were heated electrically.

Flexible Application

From the consumers' angle the problem is more complex because different people do require different amounts of heat applied in different ways to suit individual physical needs and social habits. In addition, appreciable allowance has to be made for relative degrees of exposure of buildings to the weather and their heat-insulating properties. The most effective method is, therefore, one that applies most flexibly the basic amount of heat, permitting it to be supplemented as and where wanted, and the paragraph in the Report on personal warming should be noted. Electric heaters need not be set in front of an open flue to get rid of products of combustion and properly controlled ventilation will be obtainable in other ways.

In many areas where the sub-soil is congested with other services, the small space occupied by high-voltage cables and local transformers marks them out as providing the most practicable means of distributing heat. The prospect of coping with so enormous an electrical load should cause no uneasiness. Financial considerations will prevent occupants of incompletely electrified houses from discarding their present methods immediately, especially if these are improved as is to be expected. On the other hand, the last word has by no means been said regarding electrical apparatus that will certainly be made available to meet ultimate needs.

Contractors' Licences

IT does not appear to be generally known that a Ministry of Works licence is required by anybody intending to carry out electrical installation work, under Defence Regulation 56AB. Many inquiries on the subject are received at these offices from men who wish to start as electrical contractors. This arrangement was not designed to make a "closed shop" of electrical contracting but to enable the Ministry to keep track of those who carry out work under Regulation 56A, which controls building operations. Recently the Bath branch of the E.C.A. asked the city's Electricity Committee not to permit unlicensed firms or individuals to carry out wiring work and in future the Committee will require contractors to show that they are registered.

Standard Transformers

How to gain the benefits of standardisation in rapid production and lower costs without at the same time mortgaging future progress in the interest of immediate returns presents one of the most difficult of the problems that call for early solution. The answer will probably vary in almost every instance. Transformers, which Mr. A. G. Ellis referred to as "now utility articles" in presenting his paper before the I.E.E., should be simpler to deal with than many plant items. Yet the discussion revealed divergencies of view that will not be readily squared. What, for instance, is likely to be the effect of the introduction of improved insulating materials and iron? The greatest care will be necessary also in order that inventiveness and initiative in design shall not be discouraged.

Odd Specifications

IT would go a substantial way towards reducing manufacturing costs if purchasers of transformers would accept British Standards. Some consider that the latter already allow more alternatives than are really necessary. Yet many more times the number of voltages, impedance values and outputs are ordered than come within the B.S. range. Standardisation should bring about overall economy. No doubt some individual economy is secured as regards many undertakings which call for variations from normal, but the ultimate effect is to increase manufacturing costs over the country as a whole. Other orders for odd features appear to be explainable only as relics of a pre-B.S.I. era, when engineer-purchasers produced their own private specifications.

Temporary Decline

WHILE there is no doubt that in a relatively short period the falling-off in the wartime electrical load will be more than counterbalanced by increases in domestic and peacetime industrial demand it is not surprising that the latest output figures published by the Electricity Commissioners indicate that the total power generated in December was 1·8 per cent. below the figure for the corresponding period of 1944. It is in fact a matter for congratulation that the decrease is so small in view of the inevitable dislocation caused by the change-over from war to peace conditions. It is a concrete indication of the need for proceeding expeditiously with the projected power plant extensions.

French Nationalisation Scheme

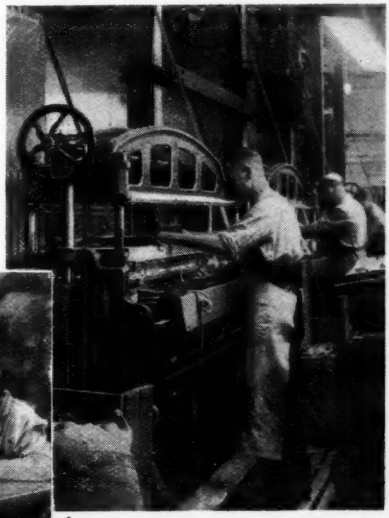
BRIEF details of the French Government's proposals for the nationalisation of gas and electricity are given in another page. Points to note are the combination of the two industries under a national organisation with regional authorities and the method of buying out the present owners. The value of the undertakings is to be assessed upon the average market quotations over a twelve-month period between 1944 and 1945 and the owners will be allotted 3 per cent. shares in the new national organisation. Special provision is to be made in respect of foreign-owned capital and installation work is to be left in private hands.

Making Boots and Shoes

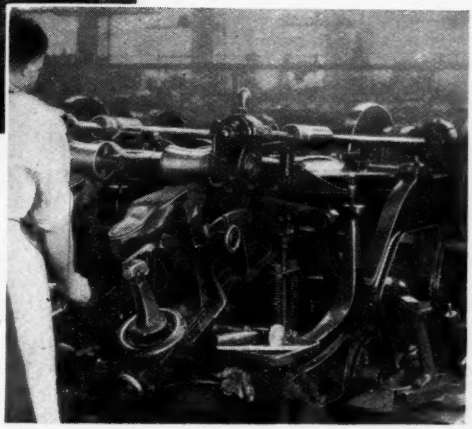
Prominent Part Played by Electricity

FOOTWEAR is still one of the commodities of which there is a severe shortage, and production will have to be stepped up considerably to meet the accumulated demands for both the home and export markets. Though materials are scarce, labour shortage is also a severe handicap to increasing production and we have therefore been trying to find out whether opportunities still offer themselves for employing electricity still further to reduce manual labour or to accelerate output.

A tour of a number of Northampton boot and shoe factories kindly arranged for us by the Northampton Electric Light & Power Co., Ltd., was disappointing in as much as it revealed extremely little scope for an extension of electrification : on the other hand it was encouraging to find an industry which has learnt to appreciate so fully the advantage of electrical operation. Future electrical developments appear to be mainly in the direction of substituting more efficient, more convenient and more economical methods of application in processes already undertaken with the aid of electricity, such as the completion of the



Above : Stamping out the soles; a 15-HP motor driving five presses. Below: A sole-leveller (2-HP motor)



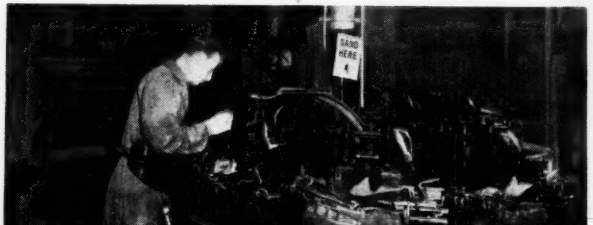
Stitching together the uppers in the closing room. All the machines on one bench are driven by a 2-HP motor. Note the 12-V needle-point lighting

change-over from group to individual drive where desirable, a transition which has in fact already been made in some cases. There is also scope for the greater use of electricity for

This stitching machine (2-HP motor) incorporates an electric wax heater

wax heating and for steam raising for softening soles preparatory to attachment. Working conditions will be further improved by an extension of the use of fluorescent lighting and improved dust extraction apparatus.

To give a further idea of the extent of the electrification of the industry it may be mentioned that with a single minor exception every one of the fifty or so footwear factories in Northampton is almost completely



"Stuck-on" press with electrically heated steam sole conditioner on the left

electrified. Furthermore, electricity is used in connection with virtually all the three hundred or so processes required to make a boot or shoe, either to provide motive power or heating or both. Yet the cost of electricity per pair of boots or shoes works out at only about ½d. to ¾d. according to the class of work. As a sequel to this remarkable degree of electrification Northampton is rightly proud of the fact that, despite its highly industrial nature, there is practically no smoke problem or atmospheric pollution to be overcome.

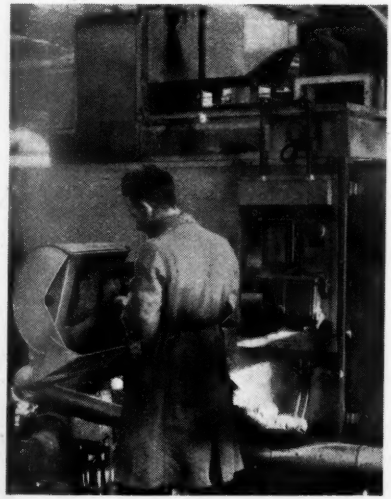
It will probably have surprised most readers to learn that there were over three hundred processes in the manufacture of footwear. To describe all of them is impossible but a brief outline of the more important ones will help to indicate how largely production is dependent on electricity. In the press room (more generally known in the industry as "the rough stuff department") the various component parts of the bottoms, soles, inner soles or insoles, toe cases (or "puffs") and heel stiffeners are stamped out by means of appropriately shaped knives which are driven through the leather by means of a heavy foot-operated press. These presses are almost invariably group-driven through V-belts, an arrangement which is better than individual drive in this particular case owing to the intermittent running and the severe momentary shock. A typical layout provides for a 15-HP motor to drive a group of five presses.

The cut pieces of leather go to an evening and grading machine which selects the smallest essential thickness, evens them to this thickness and stamps on the number of "irons" ($\frac{1}{48}$ in.) Skiving machines where required remove the rough edges from the flesh side of the leather. Insoles are rounded to accurate shape and channelled to produce lips to which the welts are attached; sometimes too they are reinforced with canvas. Heel structures are built up of a series of "lifts" (small pieces of leather), cemented, pinned and finally pressed together. Most of these machines are now individually driven by means of 1- or 2-HP motors.

The uppers, linings, etc., are cut out in the clicking department either by hand or, where mass production justifies it, by presses. For marking the leather after cutting, electrically operated and heated stamping machines are in general use. Blocking and crimping machines, as well as smoothing irons, are among other electrically operated equipment employed in this department.

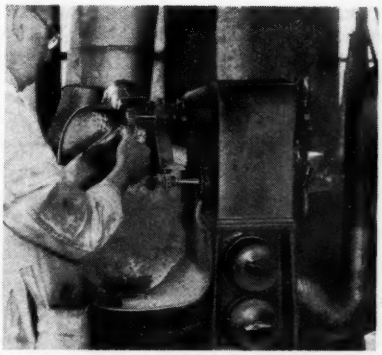
Assembly of the uppers is carried out in the closing room. Here the various components are first skived to ensure neat and comfortable seams. For decorative effect the pieces of leather are punched or perforated either by individual punches or stamped out in a single operation using a design plate, the latter method being employed, however, only for mass-production lines owing to the high cost of making the necessary dies. After beading or folding the raw edges, the various components are ready for sewing together.

Meanwhile the linings have been made in



Polishing brushes with drying cabinet in the background

another section of the department, electrically heated adhesive taping machines being employed extensively in addition to stitchers. The fronts, backs and linings are then sewn together and the assembled uppers laced up by machine to ensure accurate lasting. The eyelets are inserted and to complete the assembly of the uppers the seams are pressed smooth. Generally the machines employed



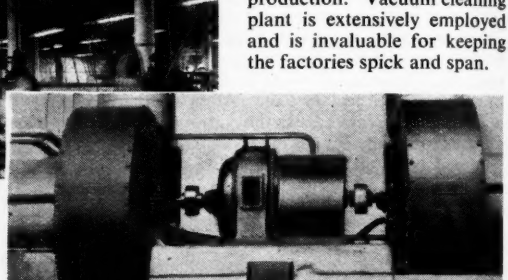
One of the latest types of sole trimmer incorporating a frequency changer to give a speed of 10,200 RPM

in the closing room are arranged on benches in groups of about ten, driven through V-belts by a 1½/2-HP motor. To augment the general illumination, 12-V needle-point lighting is provided from mains transformers.

In the making room the footwear is normally made in twelve-pair lots, each lot being placed on a separate trolley. Conveyors have been tried to assist the flow of work but owing to the varied nature of the work they have not been found of much value except in storage and despatch departments. The initial making process is the tacking of the insole to the last or former on which it remains until the boot or shoe is completed. The uppers are then placed on the last, the stiffeners are inserted between the upper and lining and the toe-puff put in. A "pulling-over" machine in a single operation drafts the upper to the last, and secures it by means of seven tacks. A side-stapling machine then further lasts the sides securing the uppers by means of staples. Lasting of the toes is effected by wiping the leather into shape and securing by means of a copper or steel wire running between the side staples. This operation is carried out on a machine called the "bed laster." The "seat" is then lasted in, also by machine.

After trimming, tapping up and smoothing, the welt is sewn in and the wire is removed. Inseam trimming follows and the welt is flattened in a welt beating machine. Insertion of a shank of metal or wood prepares the bottom for filling with granulated cork incorporated in a thermo-plastic compound. The soles are then placed on and pressed into position by a sole laying machine. A

"rough-rounder" removes the surplus leather and shapes the sole. The sole is then stitched on to the welt and afterwards levelled; heels are then attached. A slugging machine puts in a row of nails round the heels. Some soles, particularly on ladies' shoes, however, are not stitched but stuck on. For this process a "stuck-on" press is used, the soles being



Fluorescent lighting is becoming increasingly popular. Right: Extraction fans for removing dust from trimming and scouring machine.

treated in a steam conditioning cabinet (generally electrically operated) before being applied.

Of special interest in the finishing room are high-speed edge trimming machines. The ones we saw run at 10,200 RPM and are each driven by a Brook 0·6-HP motor with cutter fitted direct on to the motor spindle; current is supplied by a 50/170-cycle frequency-changing unit. Automatic edge setters are used to finish off the edges with wax (electrically heated). The heels, previously pared, are scoured with carborundum papers, coloured and burnished with wax.

After treatment with the aid of buffing machines, gum, wax and "elbow grease," the last is slipped off. The insides are smoothed, the soles are stamped, the socks are inserted and the backs are shaped. For drying the insides of the shoes air-conditioning plant is provided. Polishing and dressing includes special apparatus for removing wrinkles from the upper leather. After final inspection and touching up by hand, the finished product goes away to store and despatch, conveyors being of great service for this purpose.

The general use of dust extraction plant, especially in the finishing departments, creates a somewhat difficult problem in connection with heating. In some cases a solution has been found in installing unit fan-heaters to replace speedily the warm air extracted. Fluorescent tubes are rapidly replacing tungsten lamps in all departments and no difficulty is experienced with stroboscopic effect. Whichever type of illumination is employed the factory managers stress the value of regular cleaning which rapidly pays for itself in better lighting and consequently increased production. Vacuum cleaning plant is extensively employed and is invaluable for keeping the factories spick and span.

We should like to thank Mr. J. R. Wilson, sales manager, and Mr. G. M. Ivens, power development supervisor of the Northampton Electric Light & Power Co., Ltd.; Mr. A. Cole, works engineer, Lotus, Ltd.; Mr. R. H. Johnson, director, W. Barratt & Co., Ltd.; and Mr. P. Harries-Jones, director of Manfield & Sons, Ltd., for their help and co-operation in preparing this article.

South African Mining Plant

THE South African Department of Mines has issued the official returns for 1944 showing the value of the equipment and stores purchased by the mining industry of the Union, differentiating between those wholly or principally produced within South Africa, and those imported. Of "electrical machinery" the value coming within the former category was £330,349 and that imported was £536,700; and of "electrical machinery, spares and fittings," of South African origin, £99,700; and imported, £75,200.

Heating of Dwellings

Committee's Recommendations

A REPORT prepared by the Heating and Ventilating (Reconstruction) Committee of the Building Research Board of the Department of Scientific and Industrial Research has been issued by the Ministry of Works as No. 19 of Post-War Building Studies (Stationery Office; 228 pages, 2s. 6d. net). The terms of reference of the Committee were: To review existing scientific information and practice in this country and abroad on the heating and ventilation of buildings; to make recommendations for practice in post-war buildings, regard being had both to economy and efficiency for the individual user and to economical utilisation of the national fuel resources; to make recommendations for further research. Priority was given to dwellings by the Committee of thirty-four, which included Sir Alfred Egerton (chairman), Mr. A. C. Cramb, Sir John Kennedy, Mr. A. C. Pallot, Sir Leonard Pearce, Mr. W. M. Selvey and Mr. J. W. J. Townley.

In 1938 there were in Great Britain some 12·5 million dwellings with 3·7 persons to each taking 63 million tons of fuel for all heating services (50 millions as raw coal), including cooking and water heating. At 1½ tons per head, this revealed a poor standard of warmth with an average efficiency well below 25 per cent. In order to permit freedom of development in the fuel industries, the Committee recommends that public utility undertakings should be afforded opportunities of providing gas and electricity to all new houses at the time of their erection.

Living-Room Temperatures

Body heat is naturally maintained at a nearly constant temperature of about 98 deg. F. The heat loss from individuals when sitting is about 400 BThU per hr., of which 20 per cent. is owing to respiration and evaporation, the remainder being dissipated by radiation and convection. The "equivalent temperature" (an index of rate of cooling measured by an eupatheoscope) of a living room should generally be from 62 to 66 deg. F., but 50 to 55 deg. is enough when the room is not continuously occupied or when active housework is being done, falling to 45 deg. during the night; this would prevent excessive chilling of structures and hence liability to condensation with an outside temperature base of 30 deg. F.

Air velocity should be restricted to between 20 and 40 ft. per min., within which, however, some variation is beneficial. Temperature at head level should not exceed that at the ground by more than 5 deg. Ceiling heating alone is inadvisable in rooms less than 12 ft. high. Mean radiant temperatures 3 deg. above the air temperatures should be aimed at. Convection heating is most effectively applied to bring air and wall temperatures up to from 55 to 60 deg., a radiant source being used to "top-up" to the desired temperature.

Bedrooms should be capable of being quickly heated to 50 to 55 deg. during dressing and undressing and kept at not less than 45 to 50 deg. at other times; in at least one of them 65 deg. should be obtainable in case of illness or for use as an occasional sitting room. For halls and passages 45 to 55 deg. is adequate, but in the kitchen controllable ventilation is needed to keep humidity below 70 per cent. (30 to 65 per cent. is usually desirable) at a temperature of 60 deg.

Ventilation Requirements

Ventilation is required to prevent high concentrations of CO_2, bacteria and body odours and to remove products of combustion. The first is negligible. Four to six changes of air per hr. greatly reduce the bacteria content. For determining requisite amounts of fresh air, body odour is used as an index. The minimum is taken at 600 cu. ft. per hr. per person. In a living room of about 1,500 cu. ft. capacity, about 2,400 cu. ft. (1½ changes) per hr. are required for four people and this is obtainable with an ordinary chimney with any method of heating in operation, giving an air velocity of between 10 and 20 ft. per min. For kitchens 1,000 cu. ft. of fresh air per hr. should be enough and for passages one change, which is secured by air infiltration round doors. At least two changes per hour are needed for lavatories and bathrooms.

Hot-water installations should be capable of supplying 250 gal. at 140 deg. F. weekly to provide seven baths per week, seventy washes at basin, washing up, 10 gal. for housecleaning and 50 gal. for laundry. Provision

should be made for cooking for six persons with additional facilities for quick heating of water. Factors affecting the amount of heat needed in dwellings to maintain the foregoing conditions are dealt with in great detail with particular reference to heat losses from various types of buildings and suggestions for improving their heat insulation. The annual cost of such losses is typically of the order of 1d. per sq. ft. of external wall and over 1½d. for living rooms. The siting of a house markedly influences heat losses. Owing to fortuitous heat gains from solar radiation, cooking, water-heating, lighting and metabolism of the occupants, the inside temperature of a house is normally about 5 deg. above that of the external atmosphere.

Quantity of Heat Needed

An analysis has been made of the heat losses incurred with a typical pre-war three-bedroom terrace house (768 sq. ft. floor area), with existing heat insulation, occupied by a family of four. In order to comply with the standards advocated 19 to 25 million BThU would be required for space heating, 13 to 20 million for water heating and from 3 to 8 million for cooking plus an allowance for inefficiencies in working.

The amount of heat used in operating a 40-gal. electric or gas water storage heater is given as 287,000 BThU per week with heat insulation and 587,000 without. In both cases 225,000 BThU are used for warming the water and 22,000 are lost in the draw-off pipe ; lagging reduces the tank losses from 340,000 to 40,000.

Factors in the choice of heating appliances are considered in detail in relation to amount of fuel needed, capital and maintenance costs and labour entailed. In the most electrical of the comparative schemes drawn up, a closeable fire in the living room (33 to 39 cwt. of coke per annum) also supplies background heat through warm-air ducts to the bedrooms, where topping-up is done by electric fires (363 kWh). Background heating in the hall is provided by an electric convector (211 kWh) and in the bath-room by an electrically heated towel rail (960 kWh). For topping-up in the kitchen an electric fire would be used (846 kWh). An electric water storage heater (4,360 kWh) and cooker (1,456 kWh) complete the major installation, in addition to which there should be an independently heated clothes-drying cabinet, ventilated to the outside air, and facilities for airing clothes and linen, clothes washing machines, irons, hot-plates, refrigerator and vacuum cleaner. In the section on rural housing, it is pointed out that outdoor workers prefer high indoor temperatures and need to dry clothes more frequently than do townsfolk.

Atmospheric pollution is estimated to cost at least 20s. per head of the population per annum, of which half is attributed to domestic heating and half to railways and industry, the domestic fire being responsible for about 7s. If consumption of bituminous coals in open fires ceased, the net saving might amount to 5s. per head per annum. Fuel characteristics and fuel distribution and relative efficiencies of methods of using it are discussed at length. It is emphasised that electricity generating stations make increasing use of low-grade coal that has no easy outlet for other purposes.

Under the heading of " Foreign Practice," the great importance attached to insulation of houses is illustrated by examples from various countries in which the number of degree-days (and consequently the heating load) and also the cost of fuel is substantially greater than in Great Britain. The increase in cost of fuel here leads to considerations relating to development, installation and operation of appliances. The Committee stresses the need for standard specifications covering the chief requirements as set out that would be comprehensive enough to aid housing authorities in deciding between the claims of various appliances. It recommends that the B.S.I. should be asked to explore the question of dimensional as well as performance standardisation, in parallel with which research and testing should be actively undertaken. One of the eight appendices gives the results of a Departmental survey of the heating of working-class dwellings (84 pages), the contributions to which by Mr. A. C. Cramb and Mr. J. I. Bernard (E.D.A.) are acknowledged. The Study concludes with a 4½-page bibliography.

U.S. Electrical Workers' Strike

WITH 200,000 electrical workers on strike in sixteen American States, manufacture of refrigerators, washing machines, oil heaters, radio sets and valves has practically ceased. The strike started on January 15th over a demand by the United Electrical Workers' Union for a 30 per cent. wage increase from the Westinghouse and General Electric companies and the Electrical Division of General Motors. These three concerns produce the bulk of America's domestic electrical appliances.—*Reuter.*

Locating Cable Faults

Conditions when all Cores are Faulty but Continuous

By B. Calvert,
B.Sc.(Eng.), A.M.Inst.C.E., A.M.I.E.E.

DIFFICULT conditions for fault location occur when all the cores in a cable have a low insulation resistance to earth and between one another. The Werren overlap test may be used to obtain a location in such circumstances. Owing to possible alterations in fault conditions, however, it suffers from the disadvantage that for best results two equal bridges are required, one at each end of the cable, together with telephonic communication, so that rapid alternate readings may be obtained and averaged.

A location using ordinary Murray loop test equipment can be obtained in the following manner. Insulation resistances are first measured between cores and from cores to earth, and having tested for continuity, the cores with the highest and lowest resistances to earth are selected. A bridge is then applied to these cores as for a Murray loop test, but a loop is *not* placed across the distant ends of the cores. It is advisable to have a milliammeter in series with the DC supply lead to the bridge so that variations in fault conditions may be observed. A balance is now obtained on the bridge, and assuming the bridge to be divided into 100 units, the reading Q less than 50 should be noted.

A loop should now be put across the cores at the distant end. Provided the test voltage is not too high this should be done without switching off the supply to the bridge in order to prevent possible alterations

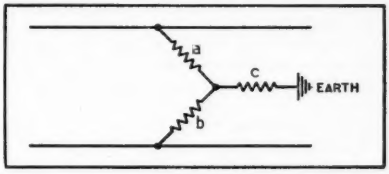


Fig. 1

to the fault conditions due to switching. Rubber gloves or other protection may be necessary to put the loop on.

The bridge is again balanced and the smaller reading Q′ noted as before. The position of the fault may now be calculated from the formula $d = \frac{L(Q' - Q)}{50 - Q}$, where d = distance of fault from testing end and L = cable route length.

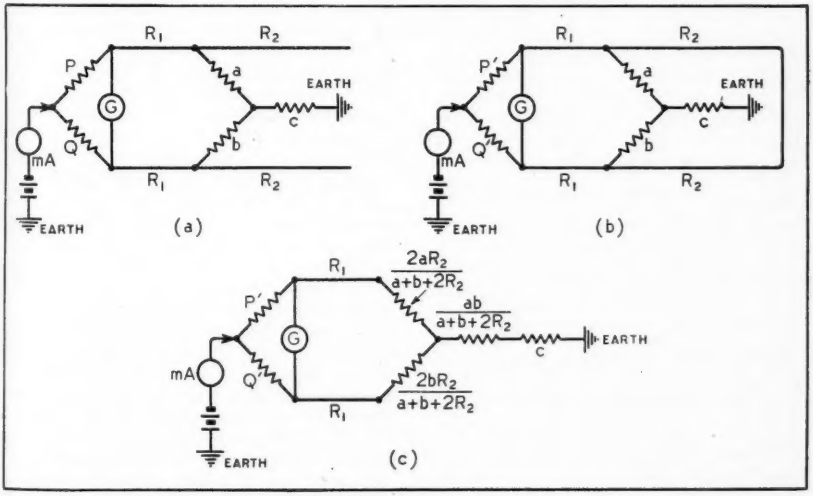


Fig. 2

The usual allowances for leads and any differences in cable sizes must be made in using the formula. If only two readings are taken, as above, then the fault conditions must be stable for accurate results. At the best the method is capable of good results and at the worst it should be possible to get a rough idea of the fault position which is of some value under the difficult circumstances. Telephonic communication between the cable ends is an advantage so that a series of alternate readings with the loop on and off may be taken and averaged.

The proof of the method is as follows :—The fault conditions between the two cores used for testing purposes can always be reduced to the form shown in Fig. 1. The first method of test may therefore be represented as in Fig. 2 (*a*), and for conditions of balance $\frac{P}{Q} = \frac{R_1 + a}{R_1 + b}$ .....(1)

With the loop across the far end the conditions may be represented by Fig. 2 (*b*). Using the delta/star transformation on the resistances a, b and $2R_2$, this may be redrawn as in Fig. 2 (*c*).

For conditions of balance $\frac{P'}{Q'} =$

$$R_1 + \frac{2a\,R_2}{a + b + 2R_2} = \frac{R_1 + \frac{2b\,R_2}{a + b + 2R_2}}{aR_1 + bR_1 + 2R_1R_2 + 2aR_2} \quad \ldots\ldots(2)$$

From (1) $\frac{P - Q}{P + Q} = \frac{a - b}{2R_1 + a + b}$ and from (2) $\frac{P' - Q'}{P' + Q'} =$

$$\frac{2R_2\,(a - b)}{2\,(R_1 + R_2)\,(a + b) + 4R_1R_2}.$$

$$\therefore \frac{P - Q}{P' - Q'} = \frac{(R_1 + R_2)\,(a + b) + 2R_1R_2}{R_2\,(a + b) + 2R_1R_2}.$$

Neglecting $2R_1R_2$ which is small $\frac{P - Q}{P' - Q'} = \frac{R_1 + R_2}{R_2}$. Substituting lengths for resistances, $\frac{P - Q}{P' - Q'} = \frac{L}{L - d}$ ..... (3)

where L = cable length and d = distance of fault from testing end.

In the field formula (3) was not easy to handle and it was modified in the following manner. The bridge is usually divided into 100 units and therefore P = 100 − Q and P′ = 100 − Q′. Substituting in (3), $\frac{100 - 2Q}{100 - 2Q'} = \frac{L}{L - d}$.

$$(50 - Q)\,(L - d) = L\,(50 - Q')$$
$$-\,d\,(50 - Q) = L\,(Q - Q')$$
$$d = \frac{L\,(Q' - Q)}{50 - Q} \quad \ldots\ldots (4)$$

This should be simpler to use since in each test only the smaller reading of the bridge need be noted and only two subtractions have to be made instead of five.

The error introduced by ignoring the term $2R_1R_2$ varies with the ratio of the resistance between the cores used for the test, *i.e.* (a + b), and the loop resistance. The distance d calculated from formula (4) will always be too small and the percentage error can be shown to be $\frac{d_1 - d_1^2}{K} \times 100$, where d_1 is the true distance of the fault from the testing end and K is the above ratio. Fig. 3 gives some curves of error for different values of K. The curves are in terms of d_1, the true fault position, whereas d will be obtained from formula (4), but the error involved when using them is extremely small.

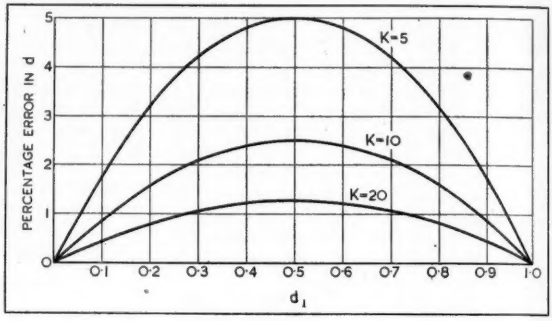


Fig. 3

The method has been checked on a model cable and results obtained agreeing with the above. Since formulating the idea, one 11-kV cable fault has occurred having all cores faulty, and the location had an error of 2·3 per cent. The route length was 4500 ft., and the fault resistances in ohms were as follows: A phase to earth, 3,800, A phase to B phase 5,500; B phase to earth 5,800, A phase to C

phase 7,500; C phase to earth 5,000, B phase to C phase 6,200.

A and B phase cores were used for the test, and since the loop resistance was 0·98 ohm, the value for K was 5,600. Comparing this value of K with those for which the curves in Fig. 3 were drawn, it was unnecessary to use any adjustment for formula error.

Conditions were varying slightly during the test and there was no telephonic communication between the ends of the cable. The fault was actually found lying in running water.

To sum up, compared with the Werren overlap method, the advantages are that one bridge only is required and to prevent a disturbance of fault conditions all tests may be taken without switching off the test current if the test voltage is not too high. The disadvantages are that the fault conditions may alter and when Q = 50 the method fails unless another core is available which gives different conditions.

Searchlight Reflectors

Different Types for Special Purposes

EVER since their Heaton works were founded in 1889 at Newcastle-upon-Tyne, seachlight reflectors have been made, chiefly for naval and military requirements, by C. A. Parsons & Co., Ltd. During the war nearly 60,000 glass reflectors were supplied to the Ministries concerned and parabolic types exceeding 7 ft. in diameter have been made.

The silvered side of the glass was at first protected by copper deposited electrolytically and coated with paint. Later on a backing of sheet lead reinforced with wire netting was added as further protection against oil fumes and salt water; it also reduced the risk of breakage, enabling the reflector to remain serviceable even when pierced by a rifle bullet or shell splinter.

A parallel beam of light is thrown by a parabolic reflector whereas a flat divergent beam is projected from a parabola-ellipse reflector; parabolic curvature on the vertical axis results in a light beam of uniform depth while the effect of transverse elliptical curvature on the horizontal axis causes the beam to converge into a vertical line at the secondary focus and subsequently to diverge at a predetermined angle. Searchlights equipped with such reflectors therefore not only project a fan-shaped beam of the required type, but the whole of the light is able to pass through a narrow vertical slot situated at the secondary focus. Consequently the searchlight can be operated behind a loop-hole where its chances of being damaged by rifle fire are very slight.

Another use for the parabola-ellipse reflector is in ships passing through the Suez Canal at night. The reflector in this instance is divided into halves along the vertical axis, and each half is fitted into a hinged frame capable of movement from side to side. Normally the combination acts as a single reflector, but it would have a blinding effect on the pilot of any other vessel that might be approaching. To avoid this danger the split reflector was devised; the hinged halves of the mirror are swung apart by the manipulation of a small lever at the back, so that the beam is divided into two parts with a dark space between them. The sides of the canal are thus brilliantly illuminated, while the approaching pilot is not in any way inconvenienced by the light.

The manufacture of rhodium-plated metal reflectors involves the electro-deposition of metals into master moulds. The main body of the reflector is of electrolytic copper having a highly polished front surface of rhodium, its reflectivity ranging from 70 to 74 per cent. in the visible range and increasing in the infra-red region. It also possesses a hard surface, which is reasonably immune from scratching: it is non-tarnishing and able to withstand temperatures up to 300 degrees C.

The searchlight mounted in the turret of army tanks has a Parsons rhodium-plated metal reflector of a special type. The light of several million candle-power is projected through a narrow slot and produces a parallel beam in the vertical plane and a fan-shaped diverging beam in the horizontal plane. The frontage illuminated is about 350 yards at a range of 1,000 yards.

Nearly 9,000 Parsons rhodium-plated metal reflectors were manufactured for war purposes.

Accident Prevention

UPON the cessation on March 31st of the wartime arrangement between the Ministry of Labour and the Royal Society for the Prevention of Accidents (formerly the "Safety First" Association) the Society proposes to maintain its existing services, restore those suspended during the war and introduce new ones. Full particulars of these services are set out in a circular received from the Society: they include the well-known green bulletins, a "Journal of Industrial Safety" and "Safety News"; posters and booklets for members on special terms; a technical information bureau and library; a safety-officer consultant service; training courses for safety officers; an annual conference, etc. The circular, which may be obtained from the General Secretary at Terminal House, 52, Grosvenor Gardens, S.W.1, also gives particulars of fees for membership.

Views on the News

Reflections on Current Topics

ONE reason given by Mr. Ellis Smith for his resignation of the position of Parliamentary Secretary to the Board of Trade was his disagreement with the policy of restricting supplies to the Home market in order to build up export trade. There will be general sympathy among the long-suffering British public with Mr. Ellis Smith's sentiments but the policy adopted by the Government is not wrong on this account. If we are to obtain essential supplies from overseas we must be prepared to pay for them by exports. The only way in which both home and export demands can be met is by greatly increased production. This must continue to be the Government's first aim for there is a danger that the despondency and sense of frustration engendered by the persistent shortage of goods in this country will have a very harmful effect. To adapt a familiar quotation :— "Where there is no vision (of better times ahead) the people perish."

* * *

Something of a sensation was recently caused at Bath by the Electricity Department's threatening to cut off the supply to the local Pitman Press works for the non-payment of an account for £600 which the company considered unreasonable. It seems that a ten-year agreement by which the company reverted from private generation to the public supply came to an end in 1944. The Electricity Department offered to renew it on the same terms but with an addition representing the increased cost of coal. The company says that while it admitted that there was justice in increasing prices to meet increased costs, the proposed increase was too great. The supply continued and apparently negotiations to arrive at an agreement failed whereupon the company was given four days' notice of the Department's intention to cut off the supply. Before the notice expired, however, the company paid the account, subject to later discussion.

It seems to me that the threat to deprive an industrial concern of electricity was a little high-handed. It was not as though the consumer was deliberately delaying or trying to avoid paying. Surely arbitration or legal proceedings would have been more appropriate in such a case.

* * *

Now that fluorescent lighting equipment is freed from restrictions I keep wondering when I am going to come across an installation in which the tubes are employed for indirect lighting, from cornices or similar situations. The units seem to me ideal for this use, especially as in their present form they do not lend themselves particularly well to decorative treatment, at any rate in the smaller rooms. Personally I do not consider that, however beautiful the fluorescent tube is in itself, the fitting that holds it can be described as attractive, its principal merit being its unobtrusiveness. No doubt the promised shorter tubes, perhaps in new shapes, will render the production of attractive housings more practicable, but in the meantime, while the fuel shortage makes me hesitate to suggest anything but the most efficient means of illumination, it does seem to me that the soft lighting obtainable from concealed tubes might in fact not only prove decorative but actually save electricity (if replacing tungsten lamps) for situations where maximum intensities of illumination are not the primary consideration, as for example in theatres, cinemas, restaurants, etc.

* * *

From America it is already possible to get a hint of the probable trend of development in fluorescent lighting. With tubes both shorter and longer than the 4-ft. and 5-ft. types so far available here, a great variety of fittings has been designed, a large proportion of them concealing the tubes behind decorative glass panelling. The latter is actually claimed to increase efficiency, but while I have my doubts about that, it is unlikely to detract to any great extent from the eminently satisfactory characteristics of the tubes.

Now that the initial novelty of fluorescent lighting is wearing off and the manufacturers and users are getting past the stage of wanting to show off their innovation, concealment of the tube from direct view would seem a logical development. The availability in the United States of a circular 32-W tube is also bringing forth a number of attractive standard, table and bed lamps, which provide about 50 ft.-candles at the reading surface. In some cases tungsten lamps are added to eliminate too sharp contrasts and provide colour warmth.

* * *

I read in a recent "Post Office News Bulletin" that when Rowland Hill, in 1837, proposed the establishment of the penny post the Postmaster-General said that of all the wild and visionary schemes he had ever heard or read of, it was the most extradordinary. Well the penny post has been a visionary scheme for over twenty years now and the prospect of its being restored seems pretty remote.—**REFLECTOR.**

Standard Transformers

Demand for Better Quality Steel

THE paper by MR. A. G. ELLIS on "Transformer Practice with Reference to Standardisation" which was summarised in the *Electrical Review* of January 18th (p. 106) was read and discussed at the I.E.E. on January 17th. The opener of the discussion, MR. J. HACKING (Central Electricity Board), mentioned the great part played by the author in the development of the wartime emergency spare mobile transformers. He said that the aim should be to have a Standard Specification which provided a reasonable amount of latitude in matters of detail. While the present Specification had done useful service, it required bringing up-to-date. If there were too big steps between adjacent capacities, the user was forced to buy a bigger transformer than he really needed so that not only had he to pay extra money, but he had additional losses, and the savings made by the manufacturer might thus be more than offset. Some standards of impedance voltage should be fixed and the Central Board had tentatively adopted voltages for impulse testing which agreed very closely with those suggested in the paper. Noise should receive further consideration; he hoped it would be possible to specify noise levels and for the designer to ensure they were met. He specially urged the need for improved qualities of iron used in transformers; the Americans and Swedes were ahead of this country. The C.E.B. also had standard bushings for all voltages, but they had only been adopted very recently.

[Specified Results]

MR. E. T. NORRIS (Ferranti, Ltd.) suggested it was necessary to standardise the results to be achieved before trying to standardise particular ways of achieving them. The first, however, had already largely been done and the main consideration now from the user's point of view was the interchangeability and replacement of the main transformer and parts. New materials were coming along. Plastics, particularly the new silicone materials, were likely to alter the design of the transformer from the insulation point of view while the improvement in the quality of iron in recent years had materially altered the proportions. Appreciable and drastic improvements could be anticipated during the next few years, and in his view, standardisation at present should be limited to such details as fittings, bushings, cable boxes, and maximum dimensions, because there was not much likelihood that future progress would result in larger transformers.

MR. F. C. WINFIELD (Merz & McLellan) thought that the user could not hope to gain anything in cost by standardisation because in many cases it would be necessary to use a larger size than was actually required. But standardisation would bring quicker deliveries in case of failures; this should lead to greater reliability. A start should be made by standardising only those transformers which already had British standard voltages laid down for them, the natural cooled transformer only to be considered. Manufacturers could be asked to produce a standard "envelope" to contain the transformer and there must be standard foundation dimensions and terminal arrangements. By these means 99 per cent. of the advantages of standardisation would be obtained and there would be greater reliability. The Americans had recently eliminated taps from small distribution transformers and he believed that we should do the same.

Oil Conservators

MR. R. M. CHARLEY, thought that the paper was not entirely up-to-date. Standard distribution transformers should have an oil conservator and should incorporate an expansion chamber and a tapping switch. The transformer makers of the country had been appealing for better quality steel for many years, but it had not been forthcoming and he urged that the Institution should register its extreme dissatisfaction with the steel industry of this country. Great Britain was being prejudiced very seriously in the export market.

MR. W. KIDD (Manchester Electricity Department) considered that the details of manufacture should not be standardised. At the same time, for urban distribution, there were now too many sizes. He, also, asked for better quality iron. At Manchester it had been necessary to depart from the British standard and specify non-standard primary voltages in which respect the present specification needed some modification.

MR. L. SMITH (British Electric Transformer Co.) counselled caution in extending standardisation to much greater lengths for the sake of mere uniformity. It would be giving less credit than was due to users to suggest that their requirements over a period of time had been unreasonable. He did not agree that by standardising a transformer for the home market, to enable it to be supplied from stock, they would be better able to compete in the export market.

MR. R. T. LYTHALL (Johnson & Phillips) thought the defect of the paper was that it devoted 99·9 per cent. to the manufacturer and the small balance to the user. Steel manufacturers must be told that the transformer industry required better quality than they were now receiving.

MR. G. H. FOWLER (City of London E. L. Co.) did not think standardisation in any sphere should be attempted until a very great measure of stabilisation had been achieved as the result of experience on the part of both the designer and the user. The constant introduction of new designs defeated the whole object of standardisation and progress should not be sought by way of a fortuitous design arising out of a multitudinous number, but rather from international progress. He thought some kind of analysis was required to show the difference between the nominal voltage of distribution and the actual working voltage, in connection with which there was some difficulty in rural networks. Also they must foresee a general linking up of distribution systems.

MR. E. TOBIN (Hackbridge Transformer Co.) urged the necessity for standardising small transformers. They should start with dimensions and he showed lantern slides to indicate his ideas.

THE AUTHOR, in reply, emphasised that standardisation was not synonymous with uniformity and certainly not with monopoly. His main object was to find out what industry wanted, and he had tried to give a lead. He was all for making it a gradual process. If we talked from the point of view that there were new materials round the corner, we might be talking in the same way ten years hence. He would be surprised if better steels were available in this country for several years. His experience was that a specification took five years to produce and half that period to revise it. He had suggested oil conservators for large transformers but not for small ones except under special industrial conditions.

Protection Against Lightning

THE protection of buildings, towers, chimneys and trees against lightning is the subject of the paper by MR. R. A. PRICE read at this month's meeting of the Association of Supervising Electrical Engineers.

The author's main endeavour is to focus attention on the relationship between the protective system and the internal wiring installation. He outlines the principles involved and the function of protective conductors, explaining how each of the latter safeguards a zone which is defined as a cone with its apex at the top of the vertical conductor, the radius of its base being equal to its height. It is necessary to prescribe such zones in order reasonably to limit the amount of work to be done in installing protective conductors. All metalwork of any size attached to buildings externally and internally, if properly bonded to the protective conductor system, can act as additional collectors and increase the zone of protection.

The roof system should form a network of about 100 ft. mesh, maximum, and air terminals should project vertically at least 1 ft. above the part of the building to which they are fixed. The most common forms of upper rod terminals are trident and quadrant ; multiple points are unnecessary embellishments.

There should be one down-lead conductor for each 100 ft. of base perimeter of the structure to be protected. One down conductor is usually sufficient for a structure having a base area of 1,000 sq. ft., provided there is a salient point of sufficient height on which to mount the air termination rod so that the whole building will be within its " cone zone." An additional down conduction is needed for every additional 3,000 sq. ft. of base area, or part thereof.

The resistance of the earthing terminations should not exceed 10 ohms, which value is obtainable by driving 0·5 in. copper rods to a minimum depth of 8 ft. into the soil. In rocky ground copper strip may be buried in trenches, but earthing plates are not recommended.

Steel structural framework can, in favourable circumstances, be used in place of down conductors; tests have shown the earth resistance of such framework to be of the order of 0·02 ohm, nevertheless it is wise to prepare the framework for such use and to earth it externally. The reinforcing of concrete structures should not be utilised in that way.

The importance of adequately bonding the protective conductors to the framework and all other interior metalwork, including the conduit system of electrical installations, is stressed.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Council of the Institution of Electrical Engineers has made the twenty-fourth award of the Faraday Medal to **Sir Edward Victor Appleton, G.B.E.**, for the conspicuous services rendered by him in the advancement of electrical science, particularly in the field of radio propagation. Educated at Bradford, and at St. John's College, Cambridge, where he took the Natural Science Tripos, Parts 1 and 2 (Physics), Sir Edward Appleton served throughout the war of 1914-1918 and became, in 1920, Assistant Demonstrator in Experimental Physics at Cavendish Laboratory, and, in 1922, Sub-lector of Trinity College. He was Wheatstone Professor of Physics, University of London, 1924-1936 and Jacksonian Professor of Natural Philosophy, Cambridge University, 1936-1939. He has written many original papers on electricity and the scientific problems of wireless communication. His early researches in connection with the propagation of radio waves and particularly on their reflection and refraction, have been of fundamental importance in the development of radiolocation, and in acknowledgment of his work and discoveries an ionospheric layer bears his name. In his capacity of secretary of the Department of Scientific and Industrial Research, since 1939, his inspiration and guidance of the use of science in many fields of national activity has been a major factor in the success of the scientific effort of this country. Sir Edward, who was made a Fellow of the Royal Society in 1927, is chairman of the British National Committee for Radio-telegraphy, vice-president of the American Institute of Radio Engineers and president of the international Scientific Radio Union.

Sir Edward Appleton

The I.E.E. Council has elected the **Earl of Mount Edgcumbe**, a past-president of the institution, an honorary member in recognition of his distinguished work as an electrical engineer, and of the services rendered by him to the Institution. Lord Mount Edgcumbe, who is a Fellow of University College, London, served his pupilage with Crompton & Co. Chelmsford, and in 1897 joined the staff at Northampton Polytechnic Institute in London. In 1900 he founded Everett, Edgcumbe & Co., Ltd., of which he is chairman and managing director. He served throughout the war of 1914-1918 and he retired from the Territorial Army in 1925 with the rank of lieut.-colonel. Lord Mount Edgcumbe became an associate of the Institution in 1897, an associate member in 1899, and a member in 1905. He served as a member of the Council from 1922-1925, as vice-president, 1925-1928 and as President in 1928-1929. He has read a number of papers before the Institution for which he has received several premiums. Lord Mount Edgcumbe has contributed valuable assistance in the international field, particularly in his capacity, from 1927 as honorary secretary of the International Electrotechnical Commission. He has represented the Institution on the councils and committees of many kindred bodies. He is a vice-president of the International Commission on Illumination, vice-president of B.E.A.M.A. and a fellow (past-president) of the Illuminating Engineering Society. He succeeded to the earldom in 1944.

Lord Mount Edgcumbe

An addition to the list of those awarded the M.B.E. in the New Year Honours is **Mr. W. A. Scott,** superintendent of the Royal Ordnance Factory, Patricroft.

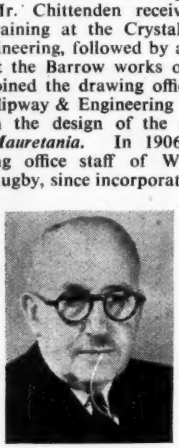
Mr. L. W. Smith, a past-chairman of B.E.A.M.A., has retired from his position as managing director of Elliott Bros. (London), Ltd., and from the B.E.A.M.A. Council. He is succeeded on the Council by **Mr. G. R. Lee,** of Elliott Bros.

Dr. S. Whitehead has been appointed director of the British Electrical and Allied Industries Research Association: he has been acting director since the retirement of Mr. E. B. Wedmore in 1944. As we stated on the occasion of his acting appointment (*Electrical Review*, June 23rd, 1944) Dr. Whitehead has taken a very active interest in the affairs of the Physical Society of which he is a fellow. He is an M.A. of Oxford and Ph.D. of London and a member of the Institution of Electrical Engineers. He has served on a number of committees of the British Standards Institution and of the I.E.E., and is chairman of

Dr. S. Whitehead

the I.E.C. Sub-Committee on High-Voltage Measurement. He has published many papers and articles on dielectrics and insulation, transmission and distribution, radio interference and other subjects.

Mr. J. P. Chittenden, M.I.Mech.E., M.I.Mar.E., A.M.I.E.E., who has just retired after forty years' continuous service with the English Electric Co., Ltd., has taken a leading role in steam turbine development. Born in 1881, Mr. Chittenden received his early technical training at the Crystal Palace School of Engineering, followed by a four years' studentship at the Barrow works of Vickers Maxims. He joined the drawing office staff of the Wallsend Slipway & Engineering Co., Ltd., and assisted in the design of the steam turbines for the *Mauretania.* In 1906 he joined the drawing office staff of Willans & Robinson at Rugby, since incorporated as part of the English



Mr. J. P. Chittenden

Mr. F. J. Cowlin

Electric Co., Ltd. Later he was transferred to the Turbine Design Department as an assistant to Mr. Izod, the chief engineer, and in 1912 was promoted to the position of chief turbine designer.

In this capacity, and later as the chief engineer of the Steam Turbine Department, Mr. Chittenden was intimately connected with the expansion of the company's steam turbine business, and directly responsible for many of its modern developments. Due to ill health in recent years it became necessary for him to take a less active interest in this work, and since 1943 he has been acting for the company as consulting engineer. He has on many occasions contributed to the technical Press, and in 1928 was awarded the Paris Premium of the I.E.E. for a paper on "High Steam Pressures and their Application to the Steam Turbine" written in collaboration with Mr. A. H. Law. For many years he was a member of the I.E.C. Steam Turbine Committee.

Since 1943, the steam turbine work has been under the control of **Mr. F. J. Cowlin,** M.I.Mech.E., A.M.I.Mar.E., on his appointment as chief engineer of the Turbine Department. Mr. Cowlin acquired his technical education at East London College and the Glasgow Technical College. His early practical training was obtained as a pupil of the late Sir Alfred Yarrow, mainly at the Scotstoun Works. His early interest in steam turbines led to his appointment to the drawing office staff of Willans & Robinson in 1911, and he has since that date been continuously employed by the company on turbine design, except between 1914 and 1918 when he held a commission in the Royal Engineers. He has been Mr. Chittenden's chief assistant since 1937. Mr. Cowlin has made many contributions to the technical Press in connection with steam turbine matters.

Mr. B. L. Wells, B.Sc.(Eng.), M.I.E.E., deputy electrical engineer to the Hammersmith Electricity Department, has been chosen for the position of chief electrical engineer. He succeeds **Mr. J. R. Jones,** M.I.E.E., who was recently appointed general manager and engineer to the Battersea Electricity Department.

Mr. J. B. Kilshaw, A.M.I.E.E., three-phase mains sectional engineer with the Bolton Corporation Electricity Department, has been appointed mains superintendent with the Oldham Electricity Department. He is vice-chairman of the Manchester Section Committee of the Electrical Power Engineers' Association and chairman of the organisation sub-committee.

Mr. H. E. Vickers, of the Fulham Electricity Department, has been appointed power station superintendent at Hull where he had previously (1929 to 1936) held the position of charge engineer.

At the January meeting of the Hastings Town Council the Mayor (Councillor F. W. Chambers) presented **Mr. A. J. Ryan,** who recently retired from the position of borough electrical engineer, with a framed copy of a resolution of the Council thanking him for his able and devoted services to the electricity undertaking over a period of thirty years.

Mr. John D. MacKenzie, after serving for six years in the Royal Engineers, the R.A.F. and the Admiralty, has now been released from service and will be resuming his peacetime activities shortly. His address is 34, Hillwood Terrace, Rosyth, Fifeshire.

Mr. J. K. Fawell, of Wingate (Co. Durham), has been appointed section engineer to the Seaham Urban District Council's electricity undertaking.

Mr. O. R. H. Bury, chairman of the London Electric Supply Corporation, Ltd., has retired from the board and is succeeded as chairman by the **Hon. E. Butler-Henderson,** a director of the company.

The recent annual smoking concert of the English Electric (Stafford Works) Engineering Society was attended by over 400 members. The chair was taken by **Mr. J. W. C. Milligan** (manager, Stafford Works) who was supported by a large number of the company's senior officials. Mr. Milligan read a letter from Sir George Nelson expressing his regret at his inability to attend due to business engagements.

Mr. Milligan mentioned that one of the Society's members, Mr. J. H. Wears, had been awarded the O.B.E. He proposed the toast of the Society and Mr. E. B. Banks, deputy commercial manager, responded. Mr. A. H. Wroe, works manager, Switchgear Works, proposed a vote of thank to the chairman.

The concert arrangements were carried out by "The Strolling Players" concert party of Stoke-on-Trent.

Mr. Richard Glass, of the Bristol Electricity Department, was the guest of honour at a lunch held at the Grand Hotel, Bristol, to mark his retirement after twenty-six years from the position of secretary of the employers' side of the No. 6 District Joint Industrial Council for the Electricity Supply Industry. Councillor C. C. Atchison, chairman, declared that Mr. Glass had been largely responsible for building the machinery of the organisation to its present efficiency. In token of appreciation of his services Mr. Glass was presented with a cheque by the Lord Mayor, Alderman James Owen.

Squadron-Leader William Crisp has now returned to his pre-war position as sales and general manager for Young & Wildsmith, Ltd., after four years in the R.A.F.

Mr. James F. Ostler, erection engineer on the electrical construction staff of the British Thomson-Houston Co., Ltd., has been appointed technical assistant to Accrington Corporation Electricity Department.

Mr. Oliver Lyttelton, chairman of Associated Electrical Industries, Ltd., and **Sir George Bailey,** chairman of the Metropolitan-Vickers Electrical Co., Ltd., have been elected vice-presidents of the British Electrical & Allied Manufacturers' Association.

Mr. Clark Ramsay, previously with the Newnes-Pearson Publishing Group, has been appointed press relations executive in E. K. Cole's Publicity Department.

British Insulated Callender's Cables, Ltd., announces that **Mr. F. Waine,** a director, has been appointed manager (commercial) and is responsible for the administration of all matters relative to the commercial side of Home business, including buying. **Mr. W. G. Hendrey** has been appointed manager (overseas) and is responsible for the administration of all matters relative to the commercial side of overseas business. Other senior appointments announced are as follows :—Commercial Division (Home Business) : Mr. H. J. Stone, deputy to manager (commercial) and sales manager (Home) ; Messrs. O. W. Minshull and A. H. Layhe, assistant sales managers (Home); Mr. V. T. Burchall, manager, Home branch offices ; Messrs. H. D. Roberts and W. E. Hind, special duties with manager (commercial); Mr. F. W. Gregory, manager, estimating department (Prescot works); Mr. C. E. Stephens, manager, estimating department (Erith works); Mr. W. S. Crick, manager, estimating department (Anchor works); Messrs. D. G. Denoon and H. Williams, joint publicity managers; and Mr. J. Connah, buyer. Overseas Division: Messrs. R. B. Paul and C. S. Bell, assistant overseas managers ; Mr. H. R. Allen, co-ordinating officer of overseas factories and special duties with manager (overseas); Mr. C. Murray, assistant liaison officer for overseas factories; and Messrs. J. Hogan, T. Lowton and H. E. N. Williams, managers for overseas estimating.

Mr. C. H. Hampson, who for many years was assistant Home sales manager of British Insulated Cables, Ltd., and **Mr. G. B. Bond,** formerly head of the Estimating Department of Callender's Cable and Construction Co., Ltd., at Leigh, have recently retired from the company's service.

The annual treat for children of employees of the Manchester Electricity Department was resumed this year after a lapse during the war period. The event was organised by the Department's Sports and Social Club, and over 600 children enjoyed a visit to the circus, and tea at the Belle Vue Gardens. **Mr. R. A. S. Thwaites,** chief engineer and manager of the Department accompanied by Mrs. Thwaites, presided at the tea.

Mr. M. B. Wilson, who has been manager of the Nottingham branch of W. T. Henley's Telegraph Works Co., Ltd., since 1934, has been appointed manager of the Newcastle branch in succession to the late Mr. W. Merrilees, and **Mr. F. Bull** is acting manager of the Nottingham branch. **Mr. S. R. Gee,** who since 1931 has been manager of the Hull branch, has become deputy manager of the Liverpool branch; he is succeeded by his assistant, **Mr. W. L. Willey,** as acting manager. **Mr. D. C. Mason,** B.Sc., A.M.I.E.E., who before joining the R.A.F. was personal assistant to the chief engineer, is appointed manager of the Bedford branch. **Mr. C. Balle,** who has been temporarily in charge of this branch, resumes his former duties as engineering district representative for the Midlands and Eastern Counties.

Mr. W. G. Larkman, assistant mains engineer (substations) to the Croydon Corporation Electricity Department has retired on superannuation after forty-five years' service.

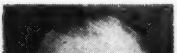
Mr. H. G. Brown, acting mains assistant to the Swinton Electricity Department, has been appointed mains assistant.

The staff of Thorn Electrical Industries, Ltd., held their first dance since the war on January 14th at the St. Pancras Town Hall. There was a large attendance from the various factories at Enfield, Edmonton, Tottenham, Hampstead, and even from the Manchester branch. One of the highlights of the evening was a cabaret, consisting of Louis Hertle, comedian and conjurer, and George Harley and Jean Barker, entertainers at the piano. Mr. Evans, the treasurer, was M.C. Mr. Holmes, in a speech of welcome, said that

the event was one of many new staff activities that were being organised and that a staff magazine was to be published. Mr. Thorn, managing director, congratulated the organisers.

Obituary

Mr. T. R. Canning.—The death occurred on January 15th, of Mr. Thomas Richard Canning, who was in his eighty-first year. In the year 1880 Mr. Canning became associated with his great-uncle, Mr. W. Canning, in his silver plating business which was extended into other plating fields and eventually became one of the largest concerns of its kind—W. Canning & Co., Ltd. He retired from active participation in the business in 1918 but remained a director and vice-chairman of the limited company which was formed in 1920, with Sir Ernest Canning as chairman. The late Mr. Canning was actively interested in municipal affairs and had been chairman of the Stratford-on-Avon R.D.C.



The late Mr. T. R. Canning

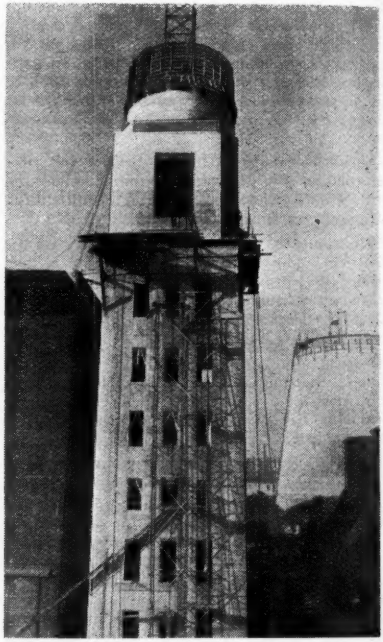
Mr. William Benison Hird, B.A., who died last week at Garelochhead, occupied for many years a leading place in the electrical industry in Glasgow and West of Scotland. After serving for several years on the technical staff of Siemens Bros., Ltd., he was in 1896 appointed electrical designer with Mavor & Coulson, Ltd., retiring at the end of 1933 with a notable record in the development of electricity in industry. With the late Mr. H. A. Mavor, he was a pioneer in the scientific work connected with the application of electrical power to marine propulsion, leading to the building in 1911 of the *Electric Arc* and, in 1913, the *Tynemount*. Later Mr. Hird devoted himself principally to developing the design of electric generators and motors for service in workshops, shipyards and mines. For thirty years he was a prominent member of the Institution of Electrical Engineers and was chairman of the Scottish Centre in 1919–20. He was also actively identified with the committees of the British Engineering Standards Association (now the British Standards Institution) in arriving at standard specifications for dynamos and motors. He was formerly lecturer in dynamo design at the Royal Technical College, Glasgow, and the author of numerous technical papers. He was eighty-two and leaves a son, Mr. Raymond Hird, who is works manager of Mavor & Coulson, Ltd.

Mr. K. A. J. Varney.—The death occurred on January 19th, at Norwich, of Mr. Kenneth A. J. Varney, managing director of Mann, Egerton & Co., Ltd.

Chimney Offices

A NOVEL feature of the reinforced-concrete chimney (350 ft. high and 22 ft. in internal diameter at the top) now being erected in connection with extensions at the Valley power station of Bradford Corporation is that the lower 100 ft. will be used for administrative offices. The total weight, approximately 2,450 tons, is supported on 120 cast-in-situ piles, 17 in. in diameter and 25 ft. long, on top of which is a 6 ft.-thick reinforced-concrete raft.

Work on the raft took some seven days, and the square portion of the block (32 by 32 ft.) was completed in just over nine days, the concrete being poured continuously between the inner and outer jacket of a wooden ascending boxmould, which was raised at an average rate of about 5 in. per hour. Frames were fitted into the reinforcement as the work progressed upward openings being left for windows and floor beams. Each of the four flue-gas inlets in the chimney plinth will carry away the gases from two 180,000-lb. per hr. boilers. The work is being carried out by Tileman & Co. to the specification of the electrical engineer and manager, Mr. T. H. Carr.



Offices built in new chimney at the Valley power station, Bradford

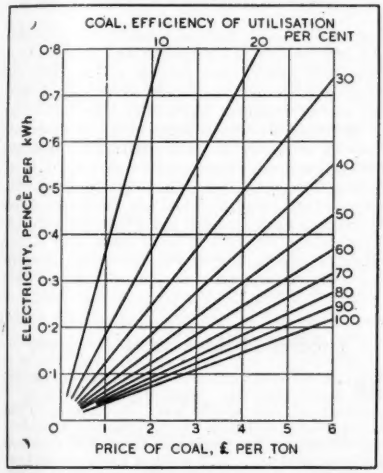
Electrifying Miners' Homes

Costs Compared with Low-Priced Fuel•

By C. R. Taylor, B.Sc., A.M.I.E.E.

A COLLIERY village must be spaciously laid out if it is not to become blighted within a few years, but the soot which begrimes its buildings and stunts its vegetation comes primarily from the domestic chimney and not from the colliery smokestack.

Each miner is entitled to one ton of "home coal" monthly for which only nominal payment is made. Averaged over the country as a whole the amount actually taken during a recent year was nine tons per miner, and the payment made 4s. 8d. per ton. Recent years have seen marked improvement



Comparison of costs of electricity and coal as fuels. Calorific value of coal 12,500 BThU per lb. Efficiency of use of electricity assumed to be 100 per cent.

in the miners' standard of living, and this is reflected in the increased use of electricity in their homes. It seems probable that there will be a demand for electrified houses on account of the saving in labour and the better living conditions which they afford.

For the purpose of ascertaining the feasibility of replacing "home coal" by electricity, and not with any idea of formulating a complete scheme, the following calculations have been made. In view of the fluctuating price of coal and the number of other factors to be taken into consideration the figures are, of course, indicative only of the position. No account has been taken of the cost of transporting the home coal, nor of the fact that gas and electricity are already purchased by the miners.

(1) Assuming the cost of coal at the pithead to be £1 per ton and of electricity generated at the pithead to be 0·3d. per kWh, then 9 tons of coal would cost as much as 7,200 kWh.

(2) With coal at the commercial price of £3 per ton delivered and electricity on a domestic two-part tariff of 9d. per week plus 0·75d. per kWh, 9 tons of coal would fetch £27 which would buy 8,000 kWh.

(3) Assuming 2 lb. of coal to be burned per kWh sent out from a small pithead generating station, 9 tons of coal would generate 10,000 kWh.

(4) Taking the calorific value of coal as 12,500 BThU per lb. and the efficiency of utilisation at 17 per cent., then 9 tons of coal burnt in the domestic grate would produce 252 million BThU of which 42·8 million would be usefully employed. This is equivalent to 12,500 kWh.

Comparative Heat Values

It would therefore be economically possible to provide some 8,000 kWh to replace nine tons of home coal. As heat energy supplied to the tenant, this would be only about two-thirds of the present value, but the "ration" of electricity would be well above the average requirements of houses on fully electrified estates, which were given in Mr. H. W. Grimmitt's chairman's address to the Transmission Section of the I.E.E. last autumn as 4,000 to 5,000 kWh per annum. (*I.E.E. Journal*, Vol. 92, Part 1, No. 49.) It may be noted that the miner's house is usually small but very well warmed.

Supplying electricity instead of home coal would offer certain important benefits to the colliery owners. Poor quality fines would be burned at the pithead power station, 6 or 7 tons of which would probably take the place of 9 tons of satisfactory domestic fuel. Many thousands of tons of the latter could thereby be released for the general market. The local electricity undertaking would also gain advantages from the increase in load.

If only 0·1d. per kWh were added to the pithead price, the revenue so obtained would amount to £2 to £4 per house, which would be considerably in excess of the annual cost of distribution.

Further considerations which would tend to influence the local authority would be the consequent improvement in the health of the inhabitants, reduction in costs of refuse collection through the elimination of ashes, saving in construction costs of new houses through the absence of chimneys and fireplaces and the freeing of floor space. These savings would go far to meeting the cost of electrification, and labour for the manufacture of electrical appliances is more likely to be readily available during the next few years than is building labour.

The area in South Yorkshire which was the subject of the above investigation would be entirely suitable for the experiment of providing electrified houses for miners. It is hoped that two large housing estates will be erected within the next few years. The local authority, on which the miners are strongly represented, owns the electricity undertaking, which draws its energy from the generating stations of the local collieries, where most of the occupiers of the projected houses would be employed. Such unity of control and interest is not, however, unusual in mining areas.

South African News

From our Cape Town Correspondent

Supply in Southern Rhodesia.—In its ninth annual report, covering the year ended March 31st, 1945, the Southern Rhodesia Electricity Supply Commission states that sales of electricity amounted to 119·7 million kWh, an increase of 6·62 per cent. The increased sales were contributed to by all classes of consumers, mining sales having recovered from the setback of the previous year.

New Graving Dock.—One of the largest graving docks in the southern hemisphere was recently completed and officially opened for service in Table Bay. According to the bulletin of the general manager of Railways and Harbours, the Sturrock graving dock will need as much electric power to operate as would be consumed by a town with a population of 20,000. The supply is taken from the Paarden Eiland power station at 12,000 V through two cables which are laid along different routes. The operation of the whole plant is automatic.

Power Plant Contracts.—The Bloemfontein municipality has accepted tenders for additional power station equipment. The British General Electric Co. is to supply turbo-alternator plant to the value of £65,755, and the International Combustion S.A. (Pty.), Ltd., boiler equipment valued at £84,508, with £2,460 for spares. Further contracts will be placed later.

Plant from Sweden.—Swedish generators of 33,000 kW and 7,000 kW have been delivered for the South African Electricity Supply Commission's Vaal generating station near Viljoen's Drift. Another 33,000 kW set is on order from Britain and two more from Sweden. The orders for these were placed before the war.

Colenso Extensions.—At the Colenso power station in Natal the river temperature with the existing load is frequently excessive at times of low flow and extensions planned will necessitate the erection of three cooling towers. Two of these will be provided at the beginning and each will have a normal capacity of 1,200,000 gal. per hr. New workshops and stores buildings are under construction to replace the existing buildings which are to be demolished for the new turbine and boiler houses.

Shortage of Electricians.—The shortage of licensed wiremen in South Africa is so acute that it has been proposed that men capable of doing such work but who have not been able to pass the licence examination should be given temporary licences until the position improves. Contractors say that if some such step is not taken it will be impossible for them to carry out wiring contracts.

Swedish Hydro-electric Progress

DURING the war years 60 new power stations were built in Sweden, several with a capacity of over 40,000 kW. According to the latest official statistics, the production of hydro-electric power has increased from 9,054 million kWh in 1939 to 12,417 million kWh in 1944, or by about 40 per cent., and the total of all water-power plants in the country is at present about 2,500,000 kW. Further plants aggregating about 600,000 kW will be completed by 1950.

The addition during 1944 amounted to 280,000 kW, of which 240,000 kW related to stations on the Indal River, where three big new plants, Midskog, Järpströmmen and Gammelänge, were brought into use and a fifth generator was installed at the Krångede station. Among works planned, the harnessing of the famous Harspranget waterfall in the Lule River will provide 250,000 kW, making it Sweden's biggest power plant. In recent years the task of regulating the Stora Lulevatten, in Arctic Lapland, has been effected through the construction of the big Suorva dam, thus creating a water storage with a maximum capacity of 113,000 million cu. ft. for the proposed station, as well as for the existing Porjus plant, Sweden's third largest power station (capacity 115,000 kW).

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Technicians for the Mines

THE scheme outlined in the *Electrical Review* of January 11th, under the heading "Technicians for the Mines" has much to commend it. It may help to solve the problem of recruitment of men into the technical departments of the mining industry. But the industry will have to offer better prospects and conditions if it wishes to retain these men after they have received such training. The number of positions within the industry are not great and unless they have some assurance that their training will be utilised it may detract considerably from the scheme.

At the present time, at one colliery, at least ten men have received training up to the Higher National Certificate standard, and an equal number are rapidly approaching this standard. These men have been trained in the use of modern mining machinery, yet after trying for years to obtain an advance in position within the industry they remain ordinary craftsmen. Their only alternative is to obtain a position outside the industry but this is impossible under the present labour restrictions.

This is not an isolated case, and any scheme which will place more men in this frustrated position will only add to the discontent which is already present amongst the technicians in the mining industry.

Morpeth, Northumberland. G. A. ROSS.

Dangerous Electrical Apparatus

YOU have recently reported that Members of Parliament around Blackpool are to be urged to suggest to the Board of Trade that a prohibition be placed upon the manufacture and sale of cheap and dangerous apparatus and that there should be legislation to control apparatus which does not conform to satisfactory standards of safety. I could hardly agree more with the sentiments expressed. This trouble has been with us so long that I feel we might do something about it ourselves.

My Area Executive Committee (Mid-East England) of the Electrical Development Association, considered this some time ago, and has sent a resolution to the E.D.A. Council which is now considering the formation of a National Proving House which will be of guidance to housewives and other purchasers. We advocate most strongly that there should be a National Mark, which with the proper co-operation and propaganda will be sufficiently well known to bridge the gap until legislation comes about. The better manufacturers will welcome it and it should strike a blow at the importation and manufacture of dangerous products.

Halifax. A. G. CONNELL,
Engineer and Manager.

Electricity Supply Clerical Staffs

I AM informed by the Association of Officers and Staff Members of Electricity (Power and Supply) Companies of Great Britain, that no organisation exists for clerical grades to obtain fair wages and salaries in the industry, other than for public authorities through N.A.L.G.O.

Engineers and electricians have unions to safeguard their interests and it appears that the clerical staffs are the lowest paid in the industry through lack of representation. It would be interesting to compare the pay of these "back-room" employees with the recent Civil Service salary increases, and no doubt employers would welcome an association to deal with this problem.

Copthorne Bank, Nr. Crawley. G. A. SIMMONS.

Copper Development Association

IT is stated in the Copper Development Association's annual report that full scale activity is to be recommenced this month. It is proposed to establish a workshop at the Association's new centre at Kendals Hall, Radlett, Herts, at which experimental work will be carried out.

A number of sag and tension charts for overhead transmission line conditions has been prepared and issued. With a view to widening the scope of work in developing the use of copper conductors and for the purpose of establishing greater uniformity in technical matters relating to their design and erection, a committee has been formed with the co-operation of all the principal manufacturers in this country.

Special attention has been given to the use of copper tubes for plumbing purposes, and to other uses of copper in building, and the report refers to the great variety of engineering and industrial applications of copper and copper alloys.

Hyperbolic Navigation

Radio Link for Anglo-American Discussion

A PAPER serving as an introduction to hyperbolic navigation was to be presented and discussed (partly by radio link) simultaneously at a convention of the Institute of Radio Engineers (New York) and a meeting of the Radio Section (London) of the Institution of Electrical Engineers held yesterday (Thursday).

The system was originally intended to enable a navigator to determine lines of position by measuring the differences between the times required for pulsed radio signals to travel from two fixed transmitting stations to the navigator's point of reception. Mr. J. A. Pierce (the author of the paper) describes the early schemes proposed by the American National Defense Research Committee for indicating the time difference as cumbersome and inaccurate. Realising the range limitation of the ultra-high frequencies first utilised, the Radiation Laboratories of the Massachusetts Institute of Technology considered the use of ionospheric reflection to extend the service range, while in 1941 experiments clearly indicated the potential stability of sky-wave transmission. Thereupon the original system was abandoned in favour of the development of new synchronising and indicating equipment for lower frequencies, now known as "Loran," derived from the words "LOng RAnge Navigation."

The British "Gee" System

During the first year of the project information about a British system, now known as "Gee," was not well understood. Both operated on identical principles and, in the author's words, "the Gee system is exactly what the N.D.R.C. ultra-high-frequency system might have become, given equally good technique and development skill . . . the result was that 'Loran' imitated 'Gee' concepts rather than technique. . ."

Apart from proof that the American system could be made to work, it was discovered unexpectedly that at frequencies below 3 Mc/s transmission was entirely stable throughout the night. That fact accelerated development of transmitters to operate at 2 Mc/s with 100-MW pulses and simplified timing equipment. In October, 1942, the first routine operation began, navigators' instruments being installed on warships of the Atlantic fleet, a naval training school for operators and navigators was founded and transmitter operation was taken over from the M.I.T. by the Coast Guard and Canadian Navy.

Hyperbolic navigation is said to be achieved when synchronised signals of a known velocity of propagation are transmitted from at least three known points, so that the relative times of signal arrivals can be measured for interpretation by a navigator. The signals may be transmitted and received by any known means, but radio is at present the most usefully accurate over long ranges. A number of kinds of signals may be employed, but pulse transmission is at present preferred because it minimises ambiguity and the transmitting power needed.

At present the hyperbolic principle is used for only three operating systems (excluding those in which the base lines are so short that each is contained within a single transmitting site); both "Gee" and "Loran" are pulse methods, while the "Decca" system employs a continuous wave. The process may be compared with celestial navigation, the determination of lines of position being essentially similar, except that hyperbolic lines involve a more complex mathematical solution than the circular lines of the celestial method. This fact is unimportant because the unchanging character of the lines permits pre-computation.

Contractors and Lighting

THE meeting of the Birmingham centre of the Illuminating Engineering Society on January 16th, at Coventry Technical College, was held jointly with the Association of Supervising Electrical Engineers and members of the Coventry Electric Club, and the Electrical Contractors' Association were invited. Mr. A. Starkey (past chairman, A.S.E.E.) introduced Mr. Ashmore (I.E.S.) who presented a paper on lighting from the electrical contractors' point of view, and showed slides illustrating the advances made in lumen output from light sources over the years.

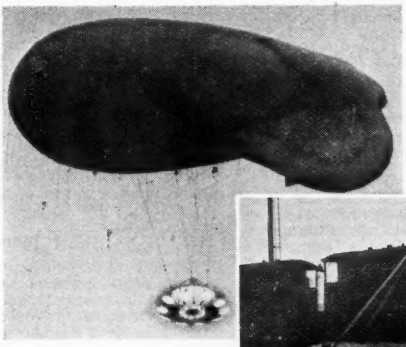
Stressing the need for educational facilities in lighting matters he said that classes were now available in Birmingham. The cost of good lighting could not be entirely evaluated in £ s. d., but had also to be measured in benefits to humanity; sight was the most precious of the senses. He suggested a new appointment in factories, that of "Services Controller," whose duties would be those which the name implied. The author gave many demonstrations.

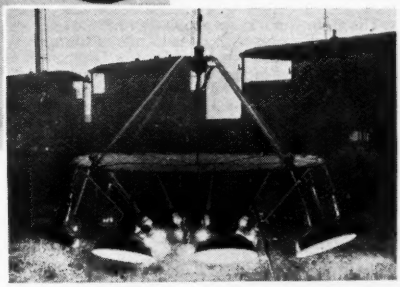
COMMERCE and INDUSTRY

Novel Lighting Scheme. Sales Staff Training

Barrage Balloon Lighting for Shunting

AN unusual lighting experiment with the aid of a barrage balloon was recently carried out in the Southern Railway's marshalling yard at Feltham. The balloon was used to raise an 8-ft. diameter ring carrying twenty 1,000-W lamps, ten of which were in 19-in. reflectors, to a height of 150 ft. above the yard with a view to testing the result of providing more uniform illumination for shunting purposes. The balloon gear was under the direction of an R.A.F. crew and mounted on rail vehicles so that the light source was mobile and could be tried in different parts of the yard. It was found that visibility was good and without glare and furthermore that the light and dark patches provided by ordinary lamp standards were avoided. As a result of this test consideration will be given to erecting permanent steel masts with wires carrying fixed lights which will reduce the number of lamp standards and much overhead wire at present in use.





Barrage balloon being used for lighting test at the Southern Railway's marshalling yard at Feltham. Right: 8-ft. diam. ring carrying twenty 1,000-W lamps

40-W Fluorescent Lamp Accessories

The Electric Discharge Lamp Auxiliaries Council announces that, arising from the introduction by E.L.M.A. of the 40-W 4-ft. fluorescent lamps, the accessory auxiliary gear for their efficient operation and for power factor correction will be available as follows: Tapless choke (30s.), power factor condenser (10s.), series condenser (10s.) and starter switch (8s.).

British Refrigeration Association

The first annual luncheon of the British Refrigeration Association is to be held at the Connaught Rooms, London, W.C.2, on Thursday, February 14th. The principal guest will be Mr. John Wilmot, Minister of Supply. The B.R.A. supersedes the Commercial Electric Refrigeration Association and the Domestic Electric Refrigeration Association.

Training Sales Engineers

At an E.D.A. area conference held at Leeds recently Mr. C. F. Wells (Yorkshire Power Co.) spoke on the subject of short-term training for electricity supply sales staff. Mr. Wells considered that the present state of transition in industry provided a favourable opportunity for tackling this problem. While there were good schemes of technical education nothing was available in this direction for sales development staff and the electricity supply industry did not appear to have produced any collective authoritative expression of opinion on the subject.

As to the qualifications to be possessed by sales engineers, the speaker stressed the need for a sound engineering training and for the right temperament, appearance and manner. The sales engineer should be optimistic and capable of maintaining enthusiasm among his staff. After briefly mentioning the question of selection, Mr. Wells came to the form of training which he considered desirable. A thirteen-week course was outlined covering technical matters, methods of dealing with consumers' inquiries, preparation of quotations, advertising practice, showrooms and exhibitions, commercial law applicable to the industry, and a number of other relevant matters.

Mr. Wells suggested that the industry was big enough to establish a central college for the training of suitable candidates. Until such a scheme was realised it was desirable that each undertaking with training facilities should appoint a full-time educational officer or a staff committee to deal with training.

Australian Import Restrictions Relaxed

In the *Board of Trade Journal* for January 19th a list is given of various classes of goods which may now be imported into Australia from sterling areas, they having been previously prohibited. The list includes welded conduit pipes and tubes; electric radiators and toasters; hair dryers; propeller type fans (other than types ordinarily used in offices and households); electroliers; radio receivers, parts and accessories; dry cells and batteries; standard and table lamps; electrolytic condensers; smoothing irons; and electrical insulating sheets of asbestos cement or similar materials. Among the classes of

goods formerly subject to administrative control and now exempt from licensing restrictions are electric heating and cooking appliances, n.e.i. (certain of these appliances, *e.g.*, stoves, ovens, cookers, grillers, boiling plates and kettles are still prohibited); static transformers; electrical condensers, n.e.i.; and telephone and telegraph cables.

Australian Electrical Trade

During the quarter ended September 30th last, electrical apparatus and equipment valued at £1,688,000 was imported into Australia, as compared with £1,726,000 in the corresponding period of 1944. In the same quarter Australian exports under this heading amounted to £76,000 (against £89,000).

Cardiff Electric Circle

It is proposed to restart the Cardiff Electric Circle which functioned before the war as a consultative and advisory body composed of representatives of the Corporation and local contractors.

New Development Areas

The Board of Trade proposes to lay an Order before Parliament with a view to scheduling two new Development Areas under the Distribution of Industry Act in the Wrexham and Wigan and St. Helens districts. The Wrexham area, it is suggested, should be managed by the existing Welsh Trading Estate Company, but an entirely new Government-financed trading estate company is proposed to manage the Wigan-St. Helens scheme.

Lightning Conductor Engineers

The National Federation of Master Steeplejacks and Lightning Conductor Engineers was inaugurated recently, its main objects being to maintain and encourage a high standard of conduct, and to promote efficiency in the industry. The president is Mr. Donald Campbell (J. W. Gray & Son, Ltd.), and the secretary is Mr. G. A. Warley, 13, Bloomsbury Square, London, W.C.1.

Fatal Accident at Substation

While working on the switchgear at the I.C.I., Landore, substation of the Swansea Corporation Electricity Department on January 15th, David Islwyn Davies (33), a technical assistant in the Department, and Edward Richards (49), a workman, received extensive burns and died later at the Swansea Hospital.

Anglo-Belgian Industrial Conversations

During last week, conversations took place between delegations representing the Central Industrial Committee of Belgium, under the president, M. Van der Rest, and the Federation of British Industries, under the leadership of the president, Sir Clive Baillieu, and Lord Dudley Gordon, ex-president. While welcoming the limited return to private trading between the two countries, the delegates placed on record their regret at the extent to which State controls and purchases, as opposed to private trading, still entered into the exchanges between the two countries. They were of opinion that the two Governments should take the earliest opportunity of extending the scope of private trading between Belgium and the United Kingdom. The delegations were in complete agreement as to the necessity for the avoidance of double taxation. Transport and communications difficulties and the future of German industry were also discussed. It was decided that each delegation should set up a Standing Liaison Committee. At the suggestion of the Belgian delegation it was decided that a further meeting should be held in Brussels at an early date.

Diamond Wire Drawing Dies

The Control of Diamond Wire Drawing Dies (No. 2) (Revocation) Order, 1946 (S.R. & O. 1946 No. 16), revoked the Control of Diamond Wire Drawing Dies (No. 1) Order, 1940, which prohibited, except under licence, the production, disposal and acquisition of diamond wire drawing dies. Questions relating to diamond wire drawing dies and quartz crystal controls, now disbanded, should be addressed to the Diamond Dies Section or the Quartz Crystal Section respectively of the Raw Materials Department of the Ministry of Supply at Westralia House, 66, Gresham Street, E.C.2.

Elliott Instruments

An unfortunate mishap resulted in the wrong caption appearing under the instrument depicted on p. 45 of our January 11th issue, which actually showed the Petch-Elliott test set for measuring by a comparison method the phase angle and ratio errors of precision current transformers. The new Shotter-Hawkes DC/AC

New precision comparator for wattmeters and voltmeters

comparator for wattmeters and voltmeters (illustrated herewith) was the subject of a recent I.E.E. paper (*Electrical Review*, December 21st, 1945) and both instruments were among the principal items displayed by Elliott Brothers (London), Ltd., at the Physical Society exhibition.

Motor Show Postponed

The Society of Motor Manufacturers & Traders, Ltd., has decided to postpone the Motor Exhibition which was to have been held in London in October. The Exhibition Hall at Earl's Court has not yet been de-requisitioned and it seems doubtful whether in any event it could be available in suitable condition in time. Furthermore a review of the marketing position

reveals that there is no need for stimulation of the demand either at home or for export at the present time. The industry is experiencing considerably greater difficulties than was expected due to shortages of labour, material and components during the changeover from war production. No interference with the development of new designs for introduction at the appropriate time will be brought about by the postponement.

Maintaining the Supply

As a postscript to the article bearing the above title in our issue of January 11th, comes the information that supplies were resumed in Salford after the fire reported in our last issue by means of equipment drawn from the national emergency pool. This equipment included a 10,000-kVA 33/11/66-kV transformer and three sealing ends with support structure for 0·3 sq. in. 33-kV cables, 200 yd. of which was supplied, together with a 6·6-kV neutral-earthing resistor with current transformers, nine sealing-end adaptor plates and eleven flexible connections.

Arc-Welding Films

Two new 16-mm. sound colour films on arc welding produced under the auspices of the Lincoln Electric Co., Ltd., Broadwater Road, Welwyn Garden City, are now available on loan, free of charge, to technical institutions, engineering firms, etc. The first is a record of the results achieved by means of arc welding during the war and it includes "shots" of nearly every major industry in the United States. Emphasis is placed on the great saving in weight, extra rigidity and strength obtained by welded steel construction and the history of arc welding is traced from its use mainly for repair work to its present-day prominence in fabrication. The prevention and control of distortion in arc welding form the subject of the second film which was made in conjunction with Walt Disney Productions to show how a steel bar behaves when heated and when it subsequently cools. Distortion is personified by an animated Disney character—"Mr. Shrink"—whose efforts are successfully thwarted by various devices.

Sheffield Power Station Accident

Two workmen, Thomas Edwards (57) and Edgar Casson (44), lost their lives and four others were injured by the bursting of a pipe in No. 1 boiler house of the Sheffield Corporation power station at Blackburn Meadows recently. Rescue efforts were hampered by the steam, which rushed from the pipe for nearly an hour before the pressure fell.

Wm. McGeoch & Co.'s War Work

During the war William McGeoch & Co., Ltd., were very largely engaged in the manufacture of electrical equipment for the Admiralty and H.M. Signal Establishments. Most naval vessels constructed contained some of the company's equipment, which included ring main switchgear, switchboards, distribution boxes, fire control gear, turret change-over switches, switch units for degaussing, wireless control boxes, radar equipment, lighting fittings, socket adaptors and plugs, bells, gongs, dimmers, brasswork, etc. Equipment supplied for the M.A.P. included switches for aircraft, and plugs and sockets, etc., for airborne lifeboats, and for the War Office special switches for searchlights were produced. Railway equipment was supplied to the Ministry of War Transport and switches to the Post Office, as well as equipment for the Merchant Navy.

Business Training Scheme

The Ministry of Labour and National Service announces that a scheme to train men and women in business administration after their release from war service will come into operation next April. The scheme is designed to make good the loss of training and progress in business management which large numbers of young men and women have suffered owing to war service, and to ensure that the capacity and high qualities they may have developed in war service are not lost to industry and commerce.

Full particulars are given in a leaflet (P.L. 188) available at any of the Appointments Offices of the Ministry of Labour.

Swiss Electrical Exports

Exports of Swiss electrical machinery increased considerably in the course of 1945. The volume of exports of dynamo-electric and steam machinery increased by about 70 per cent. over the pre-war level and exports of tools and control apparatus increased also to a large extent. Also some limited exports of spare parts of electric locomotives were reported in the course of the year. While prices for dynamo-electric and steam machinery remained almost stable at 1943 levels, the average value of exported tools and instruments were below 1942 levels.

Prospects for future exports of Swiss electrical machinery are considered favourable by the trade owing to the heavy requirements in foreign countries accumulated during the war years. In the domestic market, demand for electric cooking and heating equipment has increased considerably owing to restrictions imposed on gas consumption. It is believed that this demand will continue for some time and that electric power consumption will increase considerably.—*Reuter's Trade Service* (Zurich).

Quality Control

A handbook compiled by Dr. E. H. Sealey in 1943 for the Ministry of Supply Advisory Service on Quality Control has now been issued to the public under the title of "A First Guide Control for Engineers" (Stationery Office, 38 pages, 8 charts. 1s. net). It is designed to enable engineers without special statistical knowledge to initiate and operate a quality control system and to plot and interpret charts. All examples cited are taken from actual engineering works. The scope of the book is entirely practical and those requiring a fuller knowledge of detail are directed to BS 600R and to the several text books on the mathematical theory of the subject.

Loughborough College

A request for the admission of a considerable number of Indian students, to be trained in British engineering methods and familiarised with British engineering products, is one of the problems now facing Loughborough College, according to a survey made by the principal, Dr. Herbert Schofield, M.B.E., Ph.D., to mark the beginning of the Lent term. As an example

of the methods followed, the students run the College's own power station, which now has 3,250 HP of oil engines generating three-quarters of a million kWh of electricity a year for the college shops, laboratories, and lighting system. A 540-HP Petter engine has just been installed by British Oil Engines (Export), Ltd.

A large variety of steam and oil engines, special motor-alternator sets, material testing machines, pumps, and mining apparatus is built at the College at competitive prices for commercial users, all the work being done as part of the normal peacetime five-year course of practical and theoretical instruction.

Load Shedding

In the South-Western, South-Eastern and Central (London) areas of the Central Electricity Board's system power was cut off without warning on Friday last because the cold snap had caused loads to reach danger points. The "load shedding" began at 8.20 a.m. when there was a cut of 10 per cent., but at 8.30 a.m. 5 per cent. was restored and at 8.45 a.m. normal loads were resumed. Other cuts of short duration were made during the early part of this week.

Production Control

A booklet of 58 pages containing 16 diagrams has been issued by the British Standards Institution under the title of "Application of Production Control" as BS 1100, Part 3, at 2s. 6d. post free. It is the last of a series of which the earlier parts have covered the "Principles of Production Control" and "Production Control in the Small Factory." It covers concisely the general consideration involved in batch production (*i.e.*, the method of dealing with repetition orders that occur with insufficient regularity, certainty and quantity to call for mass production), including machinery and assembly.

Calendars

The calendar of Venner Time Switches, Ltd., is in the shape of a watt-hour meter. It has monthly sheets.

Bold easily-read dates are a feature of the monthly sheets of the calendar of Electrical & General Accessories (Leicester), Ltd. Indications of the company's wide range of products are also given.

"Radiance," a portrait of a girl in an autumn setting, appears on the calendar of the Alpha Manufacturing & Electrical Co., Ltd.

The calendar of the Horstmann Gear Co., Ltd., has two-monthly tear-off sheets with pictures of famous bridges.

Trade Publications

Porter Electrical Products, Ltd., 8, Portsdown Road, Stoneygate, Leicester.—Leaflet dealing with the patent "Portaway" earth-continuity conductor, which is easily identifiable.

Andre Rubber Co., Ltd., Kingston By-pass, Surbiton, Surrey.—Second and enlarged edition of "Elastomeric Engineering," a volume of 168 pages in stiff cover, compiled to guide designers in the uses of rubber-to-metal bonded elements in many branches of engineering. In addition to drawings, illustrations and descriptive text relating to actual applications, some detailed information is included on the manufacturing processes and the plant and tools used.

W. H. Marley & Co., Ltd., 105, High Road, New Southgate, London, N.11.—Priced leaflet describing "Marlco" parallels for measuring the effective diameter of screw threads.

Applicants for copies of these publications should write on their firms' business notepaper.

Trade Announcements

Thermolectrics, Ltd., have moved from Wimbledon to Chapel Works, Church Street, Hampton-on-Thames. Correspondence relating to accounts and remittances should be sent to the London office at Southampton House, 317, High Holborn, W.C.1.

The transfer offices of the Automatic Telephone & Electric Co., Ltd., the Telephone and General Trust, Ltd., the Anglo-Portuguese Telephone Co., Ltd., Telephone Properties, Ltd., and Thomas Bolton & Sons, Ltd., have returned to Donington House, Norfolk Street, Strand, W.C.2 (Telephone, Temple Bar 9262).

After being in the ship repairing and general engineering business for nearly 100 years, Messrs. W. Badger, 48, East Smithfield, London Docks, E.1., have recently opened up a new branch to cover all the electrical installation and repair work for the steamship companies on their books.

Gresham Transformers, Ltd., have now vacated their temporary offices at 195, Uxbridge Road, Hampton Hill, and have returned to their main factory at Twickenham Road, Hanworth. (Telephone, Feltham 2271).

The telephone number of Hogan & Wardrop, Ltd., has been changed to Clerkenwell 4293-4.

Change of Name

Lucas Batteries, Ltd. (formerly C. A. Vandervell, Ltd., and originally C.A.V. Batteries, Ltd.), have changed their name to Lucas Sales & Service, Ltd., on December 11th, 1945.

Marconi College

The Marconi School of Wireless Communication will in future be known as Marconi College.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Crawford" cookers.
"Morpeth" insulators.
"Heatmaster" electric iron.
"Micatric" fire spirals.

Pulverised Fuel Boilers

Response to Load Variations of a Direct-Fired System

By Vernon Walker, A.M.I.E.E.

IN almost all pulverised fuel installations an essential requirement is a quick response to changes in load over a wide range of output. The storage or bin system, with its reserves of prepared fuel, has been considered particularly suitable for these conditions, but developments in the direct-fired system have offset this advantage.

In a direct-fired system where the output is controlled by varying the rate at which coal is fed to the pulveriser, rapidly fluctuating loads are seldom carried without wide steam-pressure and CO_2 variations. This is due to the inherent lag of the pulveriser so controlled, and prevents the full realisation of the advantage of automatic control. Experience has shown that by maintaining a given level of fuel within the pulveriser and by controlling the output by varying the air flow through it, the time lag is eliminated to a great extent, with the result that a quicker response and range of output is obtained.

In order to co-ordinate the fuel and air inputs, the pulverisers are fitted with a feeder control, which adjusts the coal feed to conform with the air flow, which is increased or decreased in accordance with the load requirements by either hand or automatic regulation.

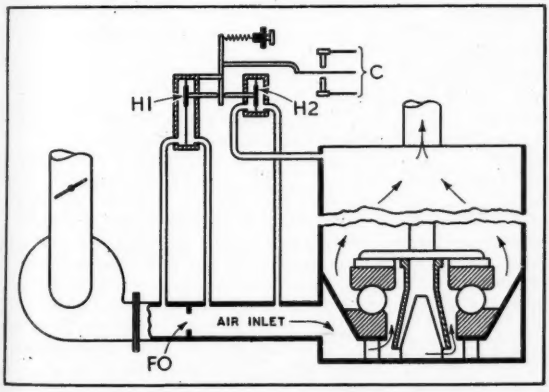


Fig. 1.—Feeder control of pulveriser mill

One system of feeder control with its relation to the pulveriser is shown in Fig. 1. At minimum output a comparatively low coal level is required around the grinding balls, while at full output the upper grinding ring is practically covered. This variable reservoir of coal not only affords a satisfactory basis for the functioning of the feeder control, but also provides adequate storage. At any given level the differential pressure, H2, across the pulveriser, will vary with the differential pressure, H1, across a fixed orifice, FO, in the air intake. As the coal level varies, the ratio between H1 and H2 changes, and the fluctuations actuate diaphragms linked with electrical contacts C, that control the feeder motor of the pulveriser.

To change the feed to the pulveriser, only the amount of primary air flow through the pulveriser need be changed either manually or automatically, the air flow in turn being governed by the load. Changes in air flow are reflected in H1 and H2, and consequently control the coal level in the pulveriser.

Satisfactory response to load changes are obtained because the coal feed is in synchronism with the air flow. With a pulveriser having a capacity of five tons per hour, there may be 1,000 to 1,500 lb. of partially ground coal in the grinding chamber at all times, and this can be recovered by increasing the air flow. The control may start the feeder when the amount of coal has been reduced to 1,000 lb., and stop it when the amount has reached 1,500 lb., so that the feeder runs for only about 60 per cent. of the time, as it generally has excess capacity. The control is adjusted to provide over-travel or under-travel of the feeder to accelerate the response.

As only one control point is required for the pulveriser feeder, the application of automatic and remote control equipment is simplified. Also, by maintaining the correct coal level in the pulveriser, the feeder control

contributes towards increased coal fineness at low and medium loads, the attendant advantages being better combustion, less carbon loss and the maintenance of ignition at low loads.

The amount and temperature of the primary air to the pulveriser affects the capacity when grinding wet coal, and where the mill output is controlled by primary air flow, it has been found that the coal is not carried out of the pulveriser until the surface moisture of the coal has evaporated. An adequate supply of preheated air is therefore required.

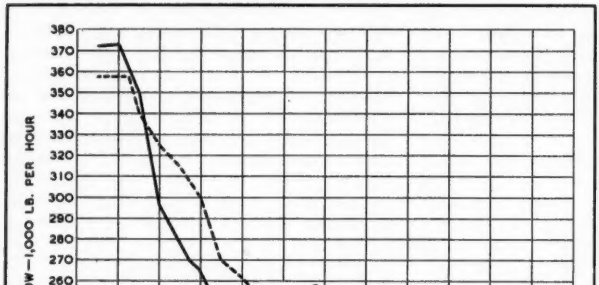


Fig. 2.—Rate of change of steam flow by tripping one pulveriser (Curve 1) combined with that obtained by varying coal feed to both mills

The result of tests using manual control of primary air and coal feed in the one case, and automatic control of the coal feed with independent control of primary air in the other, showed that the time taken to increase the boiler output from half to full load was reduced by nearly 60 per cent. by the feeder control.

Despite the flexibility in coal feed provided by feeder control, the response to the steam demand will be influenced by the character of the load changes and by the amount of heat stored up in the water and in the metal of the tubes and drums and in the furnace.

A sudden increase in steam demand will draw upon the stored heat which, pending adjustment of the fuel and air supplies, will help to supply the demand. With a sudden drop in boiler load the reverse takes place, the stored heat maintaining the steam supply when output is reduced. During the period of load change, the variation in residual heat may be large compared with the heat supplied by the coal. The supply of steam therefore depends upon the combined effect of the stored heat and the pulveriser response, rather than upon the latter alone. Where the load variations are of short duration, the residual heat enables the coal to be burnt at a nearly constant rate. Where the load changes are over a comparatively long period, the residual heat while affording the combustion control time to catch up with the demand may, if large, extend the time for the establishment of equilibrium considerably beyond that dictated by the pulveriser control.

This has been borne out in a number of tests with two large high pressure boilers in a United States power station, having slagging-bottom furnaces and refractory covered walls. Each boiler is supplied by two pulverisers and equipped with automatic control.

The tests were made to determine the time required for the rating to be reduced to half load after the coal feed had been cut down, and the effect of a widely swinging load.

On the first test, at full load, the coal feed was reduced to 47 per cent. almost instantly by tripping one pulveriser and feeder and closing the burner valves without waiting for the mill to empty. The turbine load was reduced as required, in order to maintain the header steam pressure as nearly constant as possible. This was done to eliminate the accumulator action of the other boiler and because the flow is a measure of the boiler lag.

The air flow was reduced manually over a period of two minutes. It was not reduced instantly, as with the coal feed, in order that the steam temperature might be maintained by keeping the air flow high and allowing the

CO_2 to drop. The result was that it required 9½ min. for the steam flow to level out, which represents the maximum speed through which the rating could be changed from maximum to approximately half load by a corresponding cut in fuel supply. The steam flow decreased rapidly for 3 min. and then fell at a reduced rate until it became steady at 9½ min. The header steam pressure rose slightly for the first 1½ min., then was about normal.

A second test, representing a change in output of about 40 per cent. was effected by changing the feeder speed and exhauster damper position on both pulverisers as in normal operation. The turbine load was again reduced to maintain constant pressure to eliminate accumulator action in the other boiler. It required 7½ min. for the steam flow to level off, although the load change was less than in the first test.

Fig. 2 shows a comparison of the steam flow in the two tests. Curve 1 represents the lag due to the boiler with one pulveriser tripped out and the burners shut off to reduce the coal feed instantaneously, and Curve 2 represents the combined boiler and pulveriser lag with the the feed and damper positions changed on both pulverisers. This indicates that the pulveriser lag is small in comparison with that of the boiler. That is, the rate of change in steam flow is not much greater when the coal supply is cut by tripping one of the pulverisers, than when the feed is changed.

Tests were also made to determine the magnitude of the pressure changes with rapid change in turbine load. First, the turbine load was reduced by 8,000 kW in 30 sec., the pulveriser feeder and exhauster dampers being changed at the same time. The result as indicated in Fig. 3 was that the pressure rose about 7 lb. during the first 30 sec., then after two minutes began to drop with decreasing steam to 12 lb. at 6 min., and after 9 min. was restored to normal. Next, the turbine load was increased 8,000 kW in 3 sec., the header pressure at the beginning of the test being 10 lb. below normal. As before, the feeder speeds and exhauster dampers were changed with the load. In this case the header pressure dropped 12 lb. during the first minute, and was then restored with the increase in steam flow after 6 min.

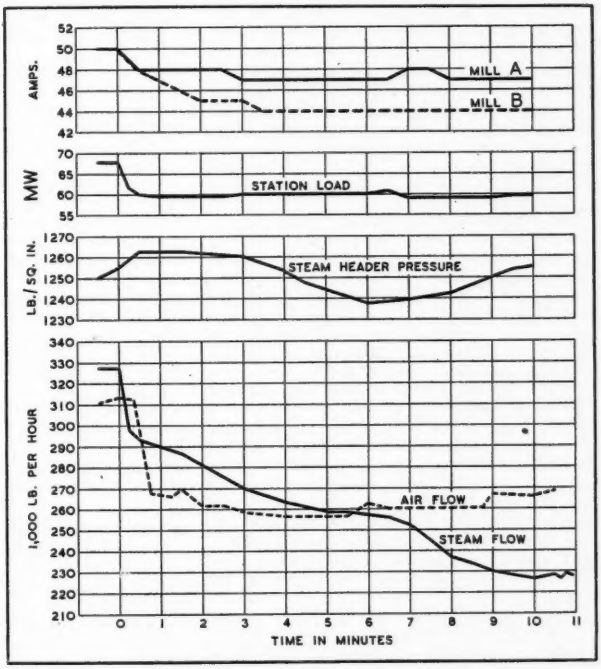


Fig. 3.—Effects of sudden decrease of turbine load

From the above, it is apparent that while normal load swings may be handled in a reasonably brief time by the flexibility of the pulveriser control without undue disturbance of pressure, if the load swing is 50 per cent. or more the stored-up heat will transcend pulveriser flexibility and dictate the time required to bring about the desired flow conditions. This is further accentuated if the design of furnace is such as to afford large heat storage.

NEW BOOKS

Advances in High Vacuum Practice. Wave Filter Design.

High Vacuum Technique. Theory Practice, Industrial Applications and Properties of Materials. By J. Yarwood. Second edition, revised. Pp. 140; figs. 90. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 12s. 6d.

The technique of high vacuum practice has, in some respects, been revolutionised in the last decade or so, by the introduction of the low pressure Apeizon products. The reviewer well remembers the time when vacuum physicists longed for a demountable tube which could be made so vacuum-tight that the "gas bogey" no longer interfered with their experiments. Soon after, the oil diffusion pump followed to take its rightful place alongside Langmuir's mercury diffusion pump. It has indeed supplemented, rather than supplanted, the latter in all technical advances in this field.

Much of the literature on recent progress is to be found scattered through the scientific journals. The present book succeeds in gathering all relevant information together and presenting it in an orderly fashion with the stress laid on practice. It is for the most part written for the technician, who requires a sufficient background of theory, to enable him to make intelligent use of the apparatus he handles. In this second edition, new sections deal with pressure-time and pressure-speed performances of vacuum pumps, construction of vacuum systems, and extra methods of measuring low pressure and pumping speeds. Both multi-nozzle types of mercury and oil diffusion pumps are dealt with, as well as a large number of ingenious devices in use for demountable tube work as, for example, rotatable cone-joints in metal, and ball-socket ground glass joints. Twenty six additional diagrams are given.

This is a well-balanced survey of achievement in this important field, particularly where it touches on practical applications. It will be welcomed by all laboratories engaged in high vacuum research for its very valuable tables of data. It contains in addition an excellent bibliography.—L.J.

An Introduction to the Theory and Design of Electric Wave Filters. By F. Scowen. Pp. 164; figs. 60. Chapman & Hall, Ltd. Price 15s.

The author states that this book is for the engineer or physicist who is not a specialist in filter design but who may need a filter in his work. The book opens with a mathematical introduction which is useful, but it seems unlikely that anyone using a book of this type would require an explanation of logs. or the definitions of the circular functions. The use of complex numbers in electrical calculations is introduced by way of differential equations instead of from vector diagrams, as would seem more natural to an engineer.

The ladder network is then dealt with and its application to filters discussed in detail, including the effects of losses in components. A feature of the book is a method of design using templates or standard curves and fully worked-out designs, using this method, are given. There is a section on the series and parallel connection of filters.

Lattice-type filters are then discussed, though not in so much detail. The quartz-crystal filter is referred to but the author considers its design to be too specialised for a book of this kind. Useful sections on the actual components used in making up a filter and on the measurement of filter characteristics, conclude the book.

The section introducing the standard curves is rather difficult to follow and the designs of a typical low-pass and high-pass filter are handled together, which does not make for ease in reading. There are several places in the book where a diagram would greatly assist the reader —especially the reader whom the author has in mind. Examples are to be found on pages 85, 129, 150 and 151. Of course, present-day restrictions may be responsible for this economy in diagrams.

It is considered that this book is a useful addition to the extensive literature on filters, as it is rather different in character from the larger treatises. The type is good, whilst the figures are adequate in size and well reproduced.—C.R.S.

A Dictionary of Metallography.—By R. T. Rolfe. Pp. 242. Chapman & Hall, Ltd. (catalogue No. 233/4). Price 15s.

This collection of definitions is more characteristic of an encyclopædia, necessarily concise, rather than of a simple dictionary. The terms included are related to physical properties and behaviour in service, so that chemical aspects are not specifically dealt with; thus metalliferous and mining terms have been excluded, but smelting and refining have been covered to a very limited extent because they can influence mechanical properties. Some electrical terms have had to be included notwithstanding discriminative selection to prevent straying into collateral sciences.

The preface explains the reasons for some deliberate omissions and the author has avoided the common habit of writing all about a term without actually defining it. No such dictionary has previously been published in this country; its compilation has been in progress for three years. It is sufficient recommendation to point out that the author is chief metallurgist to W. H. Allen, Sons & Co., Ltd.—W.O.F.

ELECTRICITY SUPPLY

Installations in Prefabricated Houses. Large Ontario Project.

Bedford.—ELECTRICAL DEVELOPMENTS.—The Electricity Committee is to change the distribution network voltage at Ampthill at a cost of £4,310; provide supplies to housing estates (£9,190); extend supplies to farms at Clapham and Kempston and the premises of T. H. Smith & Sons in Ducknill Lane (£834); extend three-phase mains for supply to factories in Castle Lane and Newnham Street (£1,956); and improve the supply in the eastern part of the borough (£5,950). Capital expenditure for the next twelve months is estimated at £121,190.

Dartford.—ELECTRICITY PREFERRED.—The Housing Committee has considered tenders for gas and electricity services at seventy-eight permanent houses in Princes Road and decided to install points for electric cookers, washboilers and fires.

CHARGES FOR APPLIANCES.—Payments for cookers and washboilers are to be spread over a period of four to six years. A scheme for simple hire is to be postponed until equipment is more plentiful. The borough electrical engineer reports that there are difficulties in operating an assisted wiring scheme at present owing to high costs and shortage of labour.

Dumbarton.—SUPPLY ARRANGEMENTS.—The Town Council is to ask the Electric Supply Corporation, Ltd., the company at present supplying the town with electricity, if it will be prepared to continue the existing agreement for a short period. This decision follows upon the ending of the Town Council's agreement with the company to operate the burgh's Electricity Supply Order and the refusal of the Electricity Commissioners to sanction a new agreement being negotiated with the Clyde Valley Power Co., Ltd. The Commissioners had also intimated that they would not approve of the Council's entering into a five-years' agreement with the Clyde Valley Co., having regard to the nationalisation proposals.

Exeter.—TENANTS TO CHOOSE.—The Housing Committee has received quotations of £13 6s. 6d. and £16 2s. respectively for gas and electric cookers. The Committee recommends that tenants of Council houses shall be given the choice.

Farnborough (Hants.).—WIRING IN PREFABRICATED HOUSES.—An important point regarding the wiring installations in prefabricated houses was discussed at a recent meeting of the Urban District Council. It was suggested that tenants should be warned not to knock nails into the walls as the wiring ducts might be penetrated. The clerk stated that the system was adopted because it was cheap; the Ministry of Health was satisfied with it and on that account the Council had accepted it. He did not know whether it was in accord with the I.E.E. Regulations.

The Mid Southern Utility Co. wrote declining to accept responsibility for anything which might happen to the internal wiring in the bungalows. The company was not entirely satisfied with the installation system, which was a complete departure from the method adopted in this country. It had been informed by the Ministry of Works that while the wiring might be reasonably safe at 110 V, the voltage in America, there might not be the same margin of safety at 230 V. It was possible that a nail knocked into the protective covering of the wiring would cause smouldering and eventually a fire. In another letter the Ministry stated that the wiring had been modified to fit the limitations of the structure. It was an old and well-tried system and there was no reason to expect danger unless the casing was penetrated.

During the discussion it was suggested that the course of the wiring should be painted a slightly different colour, but the surveyor thought that people would not like this as the wiring spread all over the house.

STREET LIGHTING.—Approval has been given to a recommendation by the Works Committee to provide mercury electric-discharge lamps in both the main and district roads at an estimated cost of £25,000. The scheme provides for 250-W lamps to be placed 150 ft. apart on the main roads, while along the district roads 80-W lamps are to be installed at intervals of 120 ft.

Finchley.—TWELVE MONTHS' PROGRAMME.—A modified development programme for the next twelve months is outlined in a report by the general manager and engineer of the Electricity Department (Mr. C. R. Westlake). The work, involving an estimated expenditure of £94,300, includes a change-over from DC to AC in part of the central area of the borough, purchase of domestic appliances, and the reintroduction of free wiring for cookers and water heaters and also of the hire-purchase and assisted wiring schemes.

Hammersmith.—BULK SUPPLY ARRANGEMENTS.—Last autumn the Electricity Committee asked the London and Home Counties J.E.A. to make representations to the Central Electricity Board regarding the bulk supply arrangements, following a breakdown which occurred on September 18th. In its reply the C.E.B. expressed the opinion that the bulk supply arrangements were still in accordance with sound engineering practice, but in view of the increase in demand which was now anticipated it had taken steps to review the problem and an early decision would be made regarding the extension required. At a meeting of the Hammersmith Electricity Committee the chief electrical engineer stated that he was not in agreement with the Board that the present arrangements were satisfactory and it was decided to write to the London and Home Counties J.E.A. giving the Council's reasons for not accepting the Board's contention.

ELECTRICAL INSTALLATIONS AT BATHS.—The Baths Committee recommends various works in connection with the electrical installations at the Lime Grove baths and wash-houses and the open-air swimming bath at an estimated cost of £5,885.

North Wales.—SHORTAGE OF POLES.—At the meeting of the North Wales and South Cheshire Joint Electricity Authority at Llandudno it was stated that the position regarding poles for carrying high-voltage lines had become

serious. Delivery dates of six months were now being quoted, and there was little likelihood of an improvement in the near future.

Oldham.—PROPOSED WIRING DEPARTMENT.—At a meeting of the Electricity Committee a resolution moved by Councillor Lethbridge that the electricity undertaking should set up a wiring department was carried by the vote of the chairman (Councillor Whittaker). The engineer (Mr. E. Binns) said it was an awkward time to start such a department, and it was agreed that he should report to the Committee later on the whole situation.

Pontefract.—PURCHASE RIGHTS EXTENSION.—The Corporation is seeking a further extension of the period for the exercise of its purchase rights over the electricity undertaking.

Portland.—SUPPLY TO MASONRY WORKS.—The Electricity Committee has arranged terms for the provision of a supply to the Bath & Portland Stone Firms, Ltd., at Slidcroft Masonry Works. The company will pay for a minimum of 50,000 kWh per annum and the Council will bear the cost of the cable extension.

Richmond (Yorks).—SUPPLIES TO VILLAGES.—Officials of the North-Eastern Electric Supply Co., Ltd., discussing the question of electricity supplies with the Rural District Council, referred to the present difficulties regarding labour and materials, but stated that the following villages were scheduled for attention:—Ravensworth, Newsham, Gayles, Dalton, Caldwell, Whashton, Downholme, Marske, Kirkby Hill and West Layton.

Salford.—INCREASED HIRE CHARGES.—The Light, Heat and Power Committee has increased the quarterly simple hire charges for domestic electrical equipment by approximately 10 per cent, making a total advance on the pre-war charges of approximately 17½ per cent., dating from March. In future, all wiring and plumbing work in connection with the simple hire of domestic electrical appliances will be borne by the consumer. If the Electricity Department undertakes the work, the following charges for dwelling houses where normal conditions prevail will be:—Cooker installation charge £3 5s.; water heater for existing cylinder £3; wash boiler £2 5s.

Overseas

Canada.—DES JOACHIMS PROJECT.—The Hydro-Electric Power Commission of Ontario is to make an immediate start on a major power development at Des Joachims where over 400,000 HP will be generated under a head of 135 ft. The scheme, which is estimated to cost $50,000,000 is the largest item in the Commission's five-year post-war programme involving a total expenditure of $200,000,000.

Electricity Output and Sales

Statistics for the Past Year

FIGURES published last week show the total amount of electricity generated by authorised undertakings in Great Britain during 1945, and the consumption and revenue in 1944-45.

TABLE I.—ELECTRICITY GENERATED

Month	1944	1945	Inc. or dec. per cent.
January	3,712	4,174	+ 12·4
February	3,594	3,295	− 8·3
March	3,691	3,383	− 8·3
April	2,886	2,926	+ 1·4
May	2,924	2,812	− 3·8
June	2,745	2,652	− 3·4
July	2,605	2,537	− 2·6
August	2,606	2,474	− 5·1
September	2,919	2,707	− 7·3
October	3,332	3,179	− 4·6
November	3,597	3,463	− 3·7
December	3,744	3,675	− 1·8

Returns rendered to the Electricity Commissioners give the quantity of electricity generated during the past calendar year as 37,276 million kWh, compared with the revised figure of 38,356 million kWh for the preceding year, a decrease of 1,080 million kWh, or 2·8 per cent. From the monthly analysis in Table I it is seen that the output this year has been less than last year in all except two months—January and April. During the last quarter of the year the gap narrowed down after reaching 7·3 per cent. in September.

The consumption and revenue figures in Table II relate to the calendar years 1943 and 1944 for companies; the years ended March 31st, 1944 and 1945, for public authorities in England and Wales; and the years to May 15th, 1944 and 1945, for public authorities in Scotland. In that period the quantity of electricity consumed per annum rose from 31,831·7 million to 32,473·1 million kWh, an increase of 641·4 million kWh (2·0 per cent.) and the revenue from £134,404,746 to £144,179,634, an increase of £9,774,888, equal to 7·3 per cent.

TABLE II.—ELECTRICITY SALES AND REVENUE

Class of Supply	kWh sold (millions)		Revenue		Average per kWh sold	
	1943–44	1944–45	1943–44	1944–45	1943–44	1944–45
			£	£	d.	d.
Lighting, heating and cooking ..	9,721·3	11,223·3	66,051,405	72,837,710	1·631	1·558
Power	20,950·4	20,043·8	64,452,895	67,049,623	0·738	0·803
Public lighting	20·1	34·6	325,432	354,978	3·885	2·462
Traction	1,139·9	1,171·4	3,575,014	3,937,323	0·753	0·807
Total	31,831·7	32,473·1	134,404,746	144,179,634	1·013	1·066

African Imports

Supplies to Kenya and Tanganyika

THE accompanying tables show imports of electrical goods into Kenya and Uganda and Tanganyika in 1944, according to the official foreign trade returns of those territories. Notes of increases or decreases compared with 1943 are given for purposes of comparison. It will be noticed that imports of radio material declined appreciably while those of lighting material increased. There was a big advance in imports of accumulators and batteries into Tanganyika. Otherwise the main tendencies were downwards.

Great interest is being manifested in Tanganyika in the Government Commission which has been appointed to report on electric power possibilities in East Africa. Tanga uses hydro-electric power from the River Pangani, where additional plant is expected shortly. Mombasa is being connected with this station.

Kenya and Uganda

Class	1944 £	Inc. or dec. on 1943 £
Electric wires and cables ..	750	— 1,150
Lighting accessories and fittings	8,700	— 2,900
Electrical goods and apparatus not elsewhere specified ..	8,300	+ 900
Light bulbs	8,700	+ 3,300
Telegraph and telephone instruments and apparatus	20,400	+ 1,500
Wireless sets	3,800	— 4,600
Other radio apparatus and parts	6,900	— 1,500
Torches, including bulbs and batteries	5,300	+ 5,000
Electrical machinery and parts..	48,600	— 1,500

Orders for certain additional plant have been placed. It is proposed that the Customs Departments of Kenya, Uganda and Tanganyika shall be amalgamated.

Tanganyika

Class	1944 £	Inc. or dec. on 1943 £
Accumulators and batteries ..	12,800	+ 7,800
Cable and wire	7,500	—
Dynamos, motors and rotary convertors, n.e.s.	4,200	— 2,200
Lighting bulbs and tubes, domestic	1,900	+ 1,300
Ditto for flashlights and hand-lamps	500	+ 440
Ditto, other	200	+ 140
Tools and appliances, portable or domestic	200	— 600
Telegraph and telephone instruments and apparatus	3,900	+ 2,900
Radio receiving sets, including radio-gramophones	1,200	— 3,000
Radio apparatus, other, including electrical gramophones and amplifiers	600	— 2,000
Electrical machinery goods and apparatus, other, n.e.s. ..	20,200	— 3,600

Road Lighting

Considerations Involved

COUNTRY road lighting was considered at this month's informal meeting of the Institution of Electrical Engineers.

Mr. C. R. BICKNELL opened the discussion with an outline of the steps that had led up to the draft of the new BS specification which is now being considered. In addition to the British Standards Institution sub-committee concerned therewith, three other committees were at present endeavouring to formulate standards for steel, cast-iron and concrete lamp columns.

It had been argued that too many local authorities were responsible for the illumination of main roads. A large number of them were so small as to have insufficient funds for the purpose. There had been an inter-departmental recommendation to group adjacent authorities for public lighting purposes, or that it should be the duty solely of county or county-borough councils, in order to reduce the cost per £ of rateable value.

There was little prospect of gas at high pressure becoming available for lighting country roads, so electricity was the only possible means. Overhead distribution was about 50 per cent. cheaper than underground cables and possessed certain other advantages for this purpose. Mr. Bicknell thought the choice of lamp lay between the mercury vapour and sodium discharge types. The endeavour should be to secure a general pattern, so as to avoid patchwork. Mr. Bicknell expressed a certain liking for wood poles, remarking that maintenance men riding bicycles would need only a few climbing irons and safety belts, so reducing cost.

Wherever distribution cables had to cross roads they should be placed underground, earth borers being suggested to avoid breaking open the road surfaces. Mechanical means of digging foundations for poles and of laying cables, where necessary, were also advocated.

Several technical aspects were raised in the subsequent general discussion.

Chilean Developments

IN a report to Ottawa on Chile as a market, Mr. M. J. Vechsler, the Canadian Commercial Secretary at Santiago, refers to the long-term programme of electrical development which Chile has undertaken, assisted in great part by credits granted by the United States Export-Import Bank. He adds the following statistics of the imports into Chile of the leading electrical goods (values in thousands of pesos) :—Insulators, 460; covered wire, 1,580; electric wire and cable, 2,155; incandescent lamps, 1,350; valves, 500; carbons and electrodes, 1,175; generators, 1,200; transformers, 2,117; resistances, 333; switchboard controls, 938; apparatus and parts not specified, 1,680; electric meters, 371; dry-cell batteries, 378; and batteries and parts, 2,230. (Chilean peso=6d.)

B.E.A.M.A. Activities

Labour Difficulties: Visits to Germany

AMONG the matters referred to in the latest issue of the "B.E.A.M.A. News Sheet" is the labour situation the difficulties of which have figured prominently in recent deliberations of the Council of the British Electrical & Allied Manufacturers' Association. A memorandum is to be submitted to the Government setting out the industry's problems and difficulties and discussions with the appropriate Ministers are being arranged.

Export trade discussions with the Board of Trade were held up during the Washington loan discussions, but the Council has now approved the re-opening of talks with the Parliamentary Secretary of the Department of Overseas Trade as soon as possible.

Reference is made to the visits of parties of representatives of the industry to German industrial establishments. It is stated that since the last report parties representing the following branches have left for Germany: electric furnaces, switchgear, insulations, rectifiers, rotating machines, transformers, fractional HP motors and domestic appliances. The Board of Trade has also approved a supplementary party to deal with insulations and a new team to deal with motor control gear. A team dealing with sheet steel which was to leave early in January was to be representative of steel makers and transformer manufacturers.

Upon the matter of deliveries of German industrial plant as reparations, the "Bulletin" says that two teams covering manufacturing plant and instruments recently left for Germany. Replying to a proposal of the Federation of British Industries that there should be a commercial investigation of German industry, the Council has stated that the Association does not feel that such an investigation is likely to be of a value commensurate with the time which would have to be spent on it having regard to the present shortage of staff in all branches of the industry.

The British Engineers' Association, the Cable Makers' Association and the Water Tube Boiler Makers' Association have agreed to the formation of a joint committee representing the principal engineering associations to discuss the drafting of conditions of contract for the Home market. Although the war is ended B.E.A.M.A. members have been recommended to continue to incorporate the standard "vesting" clause in all erection contracts which are made subject to I.E.E. Model Conditions "A." Where purchasers object to the contractor's liability being limited to the value of the contract the Association's solicitor may be authorised to negotiate, with the agreement of the member, a reasonable limit on any contract referred to him.

Forthcoming Events

Saturday, January 26th.—*Glasgow.*—Royal Technical College, George Street, 4 p.m. I.E.E. Scottish Centre. Repetition of presidential address by Dr. P. Dunsheath.

Monday, January 28th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Electrical Aids to Coal Production," to be opened by R. Crawford.

69, Greencroft Gardens, N.W.6, 7.15 p.m. Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain. "Electric Networks," by Dr. W. Saraga.

Cardiff.—Park Hotel, Park Place, 6 p.m. I.E.E. Western Centre (Installations Group). Dinner meeting.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Stray Losses in Synchronous Electrical Machinery," by P. Richardson.

Tuesday, January 29th.—*Loughborough.*—Loughborough College, 6.30 p.m. I.E.E. East Midland Sub-Centre. "Factors Influencing the Design of Electric Lighting Installations for Building Interiors," by R. O. Ackerley.

Wednesday, January 30th.—*Sheffield.*—Royal Victoria Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. "The Operation, Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on AC Systems," by R. C. Hatton and J. McCombe.

Glasgow.—Marlborough House, Langside Avenue, 7.15 p.m. Institutions of Civil, Mechanical and Electrical Engineers. (Students' Sections). Joint annual dance.

Friday, February 1st. — *Newcastle-on-Tyne.*—Neville Hall, Westgate Road, 6.30 p.m. I.E.E. North Eastern Centre (Students' Section). "Voice Frequency Telegraphy," by F. Moon.

Birmingham.—Imperial Hotel, Temple Street, 6 p.m. Illuminating Engineering Society. "The Measurement of Light," by Dr. J. W. T. Walsh.

Saturday, February 2nd.—*Manchester.*—Engineers' Club, Albert Square, 2.30 p.m. I.E.E. North Western Students' Section. "The Measurement and Reduction of Noise," by Dr. A. J. King.

Farnborough.—Grange Hostel, Hawley Lane, 3 p.m. I.E.E. Hampshire Sub-Centre. "The Design and Use of Radio-Frequency Open-Wire Transmission Lines and Switchgear for Broadcast Systems," by F. C. McLean and F. D. Bolt.

Monday, February 4th.—*Sheffield.*—The University, Western Bank, 6 p.m. Illuminating Engineering Society, Sheffield Centre (North Midland Area). "Short Cuts in Illuminating Engineering," by W. J. G. Davey.

Birmingham.—James Watt Institute, 6 p.m. I.E.E. South Midland Centre. "Some Notes on Transformer Practice with reference to Standardisation," by A. G. Ellis.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

General Cable Manufacturing Co., Ltd.—At the annual meeting the chairman (Mr. C. W. R. Pantlin), after referring to the production of cables for the Services during the war, spoke of the extensive developments which the company had in hand. These, when completed, together with a comprehensive reconditioning scheme, would allow the works to maintain a steady and increased production, on economic lines. These plans, which were formulated some considerable time ago, had been much delayed by circumstances outside the company's control, but every effort was being made to complete them.

Taking into consideration the present difficulties, it was true to say that the company was emerging with credit from the post-war transition problems. Nowadays its difficulties were mainly concerned with production, for with the termination of war contracts commercial orders had increased to a remarkable extent, and it would seem that there would be no great difficulty in maintaining a high sales figure. Accordingly it was possible to view the future with a good deal of confidence, as the production problems would undoubtedly be solved. The current trading position was more than satisfactory, although the scarcity of man-power must of necessity influence the final result.

The Westinghouse Brake & Signal Co., Ltd., reports a trading profit, together with dividends and interest, for the year to September 30th last of £319,086 (against £408,519 for 1943-44). E.P.T. recovered amounts to £48,500 (against a charge of £51,625); £171,700 (£195,000) is provided for income tax on profits of the year; a sum of £104,873 in respect of charges relating to a pre-war contract is charged to contingencies; and the net profit for the year is £195,886 (£161,894). General reserve receives £50,000 (nil), pensions account £15,000 (same), and provision for contingencies (£50,000 (£70,000). After paying a dividend of 10 per cent. and a bonus of 4 per cent. (same) £96,192 (£93,872) is carried forward.

Adelaide Electric Supply Co., Ltd.—The gross revenue for 1945 was £1,636,892 (against £1,533,734 for 1944) and the net revenue, after meeting operating expenses and taxation, was £570,150 (£510,037). After providing for debenture stock interest and sinking funds, the cost of raising new capital, and transferring £162,114 to general reserve, the balance for appropriation was £292,829. Interim preference and ordinary dividends absorbed £133,122 and final dividends £151,328, the balance carried forward for the year being £167,495 (£159,116). The number of consumers connected increased by 2,018 to 114,873 and the kWh sold rose by 6·36 per cent.

In his address at the annual meeting in Adelaide the chairman (Mr. J. Stanley Murray), referring to the Electricity Trust Bill empowering the South Australian Government to acquire the company's undertaking (which subsequently received its third reading), said he was strongly tempted to reply to some of the mis-statements that had been made and misconceptions that had emerged. He contented himself, however, with saying that he saw no reason to withdraw or alter one word of his statement at the earlier meeting of stockholders. On the operation of the undertaking, he said that the first turbo-alternator for the Osborne " B " station had arrived from England; the target was to have the set in operation by June next, although man-power difficulties might delay it a little. Restricted experiments confirmed the opinion that, even with the present high price of New South Wales coal, the economics of Leigh Creek coal were bad and that its use resulted in a negligible saving of N.S.W. coal.

Radio Rentals, Ltd.—The accounts show a trading profit for the year to August 31st last of £125,983 against £111,178 in the previous year, but the latter amount was arrived at after deducting an unstated amount for depreciation of radio sets. The chairman explains that the sets have been written down so stringently in past years that their value is now merely nominal. The directors have therefore transferred £40,000 (against nil) to reserve for radio set replacement and post-war contingencies. After provision for tax, preference dividend, etc., and maintaining the ordinary dividend for the year at 20 per cent., £55,399 (£54,003) is carried forward.

Broom & Wade, Ltd., report a net profit for the year to September 30th last of £276,285 (against £235,875) before providing £228,852 (£199,243) for taxation. The total dividend on the ordinary shares is maintained at 22½ per cent., £20,000 (£17,692) is allocated to reserve and £37,599 (£32,333) is carried forward. During the year 124,630 new 5s. ordinary shares were issued to shareholders at 18s. 9d. each and 6,370 were sold on the market at 23s. 9d. The premium, after expenses was £91,019, bringing the capital reserve up to £158,965.

E. K. Cole, Ltd., report a net profit of £97,465 for 1944-45, after meeting depreciation, taxation, etc., against £138,165 for the preceding year. The final ordinary dividend is 12 per cent. again making 20 per cent. for the year and a participating dividend of 3 per cent. (same) is declared on the preferred ordinary shares.

The Traction & General Investment Trust, Ltd., reports a net revenue of £33,939 (against £34,406). It is proposed to pay a final dividend on the ordinary stock of 5 per cent. (less tax at 9s.), again making 7 per cent. for the year.

Redfern's Rubber Works, Ltd., are paying a final dividend of 6¼ per cent. plus a bonus of 2 per cent., again making a total distribution of 12 per cent. for the year. The net profit for 1945 was £65,670 (against £85,844).

Bennis Combustion, Ltd., has announced an interim dividend of 5 per cent. (same).

R. A. Lister & Co., Ltd.—The accounts for the year to September 30th last show a net profit of £137,077 (against £127,735). The final ordinary dividend is 5 per cent., plus a bonus of 6 per cent., again making a total distribution of 16 per cent.

for the year. Allocations are: £50,000 (same) to general reserve; £10,000 (nil) to welfare reserve; £10,000 (nil) to additional pensions reserve; and £2,000 (£11,500) to write off the entire cost of goodwill in the purchase price of new businesses. A sum of £73,836 (£73,759) is carried forward. It is stated that an increase of capital is under consideration to meet the needs of future development at home and abroad.

S. Smith & Sons (England), Ltd., have announced details of their new share issue. It will comprise 94,271 of the unissued 7 per cent. non-cumulative £1 preferred ordinary shares at 75s. per share and 527,919 deferred ordinary 1s. shares at 11s. per share. These will be offered to the present holders of preferred and deferred ordinary shares in the proportion of one share for each four held. A total of about £640,000 will be raised by the issue.

New Companies

Bamber Electrical & Engineering Co., Ltd.—Private company. Registered January 4th. Capital, £1,000. Objects: To carry on the business of electrical, mechanical, motor and aeronautical engineers, wireless dealers, etc. Directors: D. P. Bamber and Mrs. L. Bamber, both of 14, Pilgrims Lane, N.W.3. Registered office: 170, Piccadilly, W.1.

Jackson & Bunn, Ltd.—Private company. Registered January 4th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, dynamos, batteries, accumulators, motor vehicles, cycles and accessories, gramophones, wireless apparatus, etc. Subscribers: D. H. Jackson, 5, Bushey Mansions, Grand Drive, S.W.20, and L. H. Bunn, 70, Louisville Road, S.W.7.

City and Central Electrical Co., Ltd.—Private company. Registered January 8th. Capital, £1,000. Objects: To carry on the business of electrical and mechanical engineers, electrical contractors, sign specialists, etc. Directors: A. H. Findlay, 149, Friern Road, S.E.22, and two others. Registered office: 10, Whitecross Place, Wilson Street, E.C.2.

C. Lewery & Co., Ltd.—Private company. Registered January 10th. Capital, £210. Objects: To carry on the business of electrical engineers and contractors, etc. Directors: C. Lewery, 72, Victoria Road, Shoreham-by-Sea; T. Morris, 52, Portland Avenue, Hove; and F. A. Hammond, 27, Church Street, Shoreham-by-Sea. Registered office: 211, Albion Street, Southwick, Sussex.

Rex Bros., Ltd.—Private company. Registered January 10th. Capital, £200. Objects: To carry on the business of electrical engineers and contractors, etc. Directors: L. H. Rex, electrician; and Mrs. E. D. Rex, both of 424, Shirley Road, Birmingham, 27. Registered office: 461, Warwick Road, Tyseley, Birmingham.

Remion Radio Equipment Co., Ltd.—Private company. Registered January 14th. Capital, £1,000. Objects: To carry on the business of general engineers, general and electrical contractors, manufacturers, repairers, importers and exporters of, and wholesale and retail dealers in, radio-frequency heating equipment, aboratory and industrial electric measurement equipment, etc. Subscribers: H. W. Fisher, 36, Southampton Street, Strand, W.C.2, and Margaret E. Crichton, 36, Lyndhurst Gardens, Finchley, N.3. Secretary: M. E. Crichton. Registered office: 36, Southampton Street, W.C.2.

Hi-Craft Electrical Products, Ltd.—Private company. Registered January 14th. Capital, £100. Objects: To carry on the business of manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, switches, conductors, etc. Subscribers: G. Conrad, 103, Phyllis Avenue, New Malden, and C. H. Treble, 15, Maybank Avenue, Sudbury, Wembley. Solicitors: Clifford-Turner & Co., 1, Queen Victoria Street, E.C.4.

Courtney Pope (Electrical), Ltd.—Private company. Registered January 12th. Capital, £1,000. Objects: To carry on the business of electrical and mechanical engineers, etc. Directors: L. Courtney, Dunster Croft, Beech Hill, Hadley Wood, Barnet, and five others. Registered office: Adjoining 341, Seven Sisters Road, N.15.

Radio Agencies, Ltd.—Private company. Registered January 3rd. Capital, £100. Objects: To carry on the business of radio and electrical dealers, etc. Directors: E. G. Harris and Mrs. Jane Harris, both of 17, Albion Mews, W.2. Registered office: 10, Adam Street, W.C.2.

Increases of Capital

Dictograph Telephones, Ltd.—The nominal capital has been increased by the addition of £50,000 in 500,000 ordinary shares of 2s. each beyond the registered capital of £200,000.

Mortgages and Charges

Electrolumination, Ltd.—(a) Charge on 199b, Borough High Street, S.E., dated December 31st, to secure £5,000 to Sissons Bros. & Co., Ltd., of Hull, and £1,500 to Barclays Bank, Ltd. (b) Particulars filed of £6,500 debentures authorised December 27th, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Liquidations

Dome Electric Co., Ltd.—Meetings February 20th at the offices of Harry L. Price & Co., Ltd., 47, Mosley Street, Manchester, to receive an account of the winding up by the liquidator, Mr. A. T. Eaves.

Whitehead Switchgear & Inventions, Ltd.—Liquidator, Mr. L. S. Findlay, 35, Windsor Place, Cardiff, released December 18th, 1945.

Bankruptcies

F. O. Tosswill, electrical engineer, lately carrying on business at 15, Portsmouth Road, Guildford.—Supplemental dividend of 1s. 7¼d. in the £ payable January 25th at the office of the Official Receiver, 42, Tavistock Square, W.C.1.

G. S. Elliott, electrical engineer, 70, Rupert Street, Norwich.—Order for discharge made December 17th, 1945, suspended for twelve months.

STOCKS AND SHARES

THE general condition of Stock Exchange markets continues healthy. Exceptions can be found here and there to the strength of markets, but in spite of a lurking degree of caution in regard to shares in companies which come into the nationalisation field, investment is readily absorbing good-class securities as these come on offer. Hopes are already being expressed that next April's Budget will bring about tangible relief in taxation and it is thought, moreover, that the next British Government loan to be floated will offer terms even more modest than those of the last issues. Consequently British Government funds are decidedly strong.

Transport Stocks and Supply Shares

Home Railway prior-charge stocks are included in the demand for gilt-edged securities. Southern Railway 5 per cent. preference at 114 had added 2½ to its last week's gain of 4½. In the junior category, Transport "C" at 63 is 1½ up. British Electric Traction deferred has gone back 15 to 1050. Amongst overseas issues, Calcutta Trams are 1s. better at 72s. 6d. Brazilian Tractions hold part of their previous gain, at 31⅝. Calcutta Electric Supply have reacted to 60s. 6d., while Cawnpore Electrics at 62s. 6d. are harder on the week. The list of Home electricity shares shows gains in Clyde Valleys and Metropolitans, both 41s.; County of London 40s. 6d.; Yorkshires £2 and North Easterns 32s.

Miscellaneous Movements

Cable and Wireless ordinary fell 2½ to 99 and the preference a point to 111. This did not prevent Globe ordinary being raised to 44s. Great Northern Telegraphs weakened to 31½. Withdrawal of transatlantic support led to Canadian Marconi receding to 21s. 3d. International "Tel. & Tel." eased off to 36½, in consequence of the labour troubles in the United States. Montreal Power shares at 26½ are a dollar down.

Hopkinsons are up 2s. 6d., at 4½; Murex 1s. 3d., at 92s. 6d., and Associated Electricals 1s., at 57s. 6d. General Electrics at 94s. 3d. have gained 6d.; so have Henley's 4½ per cent. preference at 25s., Crabtrees at 44s., and British Vacuum Cleaner at 36s. 6d. Radio shares are quieter than of late. Cossor rose to 46s. 6d., to revert to the previous price of 45s. 6d.

Cable Manufacturers

Estimates vary on the subject of the first dividend due to be paid this year by British Insulated Callender's Cables, which was registered last May after the fusion of the two companies. In the market, some forecast 7½ per cent., and others expect 8 per cent. With the shares at 46s., the yield would work out at £3 5s. 3d. per cent. on the lower dividend estimate, and at £3 9s. 7d. per cent. on the higher. Johnson and Phillips at 82s. pay £3 9s. per cent., and on Henley's at 28s. 3d., the yield is just over 3½ per cent. Enfield Cable at 62s. 0d. give the more generous return of £4 0s. 8d. per cent. and Siemens are on much the same basis. The estimates quoted for B.I.C.C. are necessarily based upon intelligent guesswork about the earnings of the combine. The dividend policy of the directors of the new company remains, in any case, to be seen.

In valuing the shares of the leading cable manufacturers on a 3½ to 4 per cent. yield basis, the market witnesses that the war and its aftermath have done nothing to shake the long-established confidence of investors in this section of the industrial market. It is generally supposed that reconversion problems will be less formidable than is likely to be the case with industries compelled by the war to adapt their plant and equipment to products far removed from the normal.

Oriental Telephone

An abrupt rise in Oriental Telephone shares which carried the price to 5s. 9d. one day last week to 65s., was followed by a reaction to 62s. 6d. The company has issued a notice to the effect that operation of the telephone service in Singapore and Johore Bahru is being resumed, and that the Oriental Telephone Co. expects to take over the undertaking from the military authorities at an early date.

Westinghouse Brake Results

Westinghouse Brake & Signal have had no difficulty in maintaining the distribution for 1944-45 at 14 per cent. (including 4 per cent. bonus), the same rate as was paid for each of the two preceding years. A small reduction in gross profits is more than offset by recoveries under the heading of E.P.T., so that after the distribution, there again remains a substantial surplus for reserves and the carry-forward. The £1 shares stand at 75s., at which the yield works out at a modest £3 14s. 9d. per cent. Immediately before the war the company was distributing 17½ per cent.

Tube Investments

Tube Investments are amongst the front rank industrials for which at the present time there is a considerable demand. The company during the three war years 1941-1943 inclusive, paid 20 per cent., raising this to 22½ per cent. for 1944 and, in respect of the year ended October, 1945, the same rate, plus a special dividend fo 10 per cent. The addition came out of a war contingencies reserve, and it would be, of course, unwise to count upon any repetition of this 10 per cent. The safe calculation is to take the dividend as 22½ per cent., at which the yield on the money at the present advanced price of £6 is 3¾ per cent. At the meeting last November the chairman stated that no great difficulty was expected in the securing of export business during the next year or two.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

E. C. ALDRICH and Benjamin Electric, Ltd.—"Lighting fittings." 21828. December 30th, 1943. (574438.)

British Thomson-Houston Co., Ltd.—"Refrigerating machines." 578/44. January 19th, 1943. (574464.)

British Thomson-Houston Co., Ltd., A. Grieve, D. F. Welch and W. J. Scott.—"Hermetically sealed spark gaps." 3076/42. April 9th, 1943. (574452.)

British Thomson-Houston Co., Ltd., J. H. Walker, E. C. Barwick and B. Pringle.—"Heteropolar polyphase inductor alternators." 16301. October 5th, 1943. (574325.)

Brush Development Co.—"Piezo-electric transducers." 525/44. January 11th, 1943. (574463.)

Budd Wheel Co.—"Motor generators." 10606/43. January 12th, 1942. (574390.)

F. B. Dehn (Adel Precision Products Corporation).—"Conduit fastener." 17558. October 25th, 1943. (574424.)

General Electric Co., Ltd., and S. K. Lewer.—"Piezo-electric frequency-control devices." 12986. October 11th, 1943. (574398.)

H. M. Harmer and F. J. Cook.—"Electric current converting systems comprising vibratory relays." 19248. November 18th, 1943. (574428.)

Jack & Heintz, Inc.—"Relays terminal assemblies. 16826/43. July 7th, 1942. (574327.)

Jensen Radio Manufacturing Co.—"Acoustic horns." 11876/43. July 23rd, 1942. (574394.)

L. Lacoste.—"Connecting device for electric cables." 15744/43. February 22nd, 1944. (574323.)

Marconi's Wireless Telegraph Co., Ltd.—"Antenna input circuits for radio receivers." 1591/44. January 28th, 1943. (574407.)

M. O. Valve Co., Ltd., G. F. Klepp and J. A. Smyth.—"Electric discharge devices having coated cathodes supported intermediately between their ends." 5294. April 2nd, 1943. (574383.)

F. Newton.—"Carbon pile electric regulators." 7423/43. March 24th, 1942. (574456.)

Philco Radio & Television Corporation.—"Portable radio receiver." 1049/44. January 28th, 1943. (574373.)

F. Rimmington.—"Electric soldering irons." Cognate applications. 11643/43 and 13340/43. July 17th, 1943. (574392.)

T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd.—"Electric remote control systems." 64. January 3rd, 1944. (574371.)

G. R. Shepherd (Westinghouse Electric International Co.).—"Thermal electric switches." 20962. December 14th, 1943. (574334.) "Electric insulating compositions." 5747. April 9th, 1943. (574356.)

Standard Telephones & Cables, Ltd.—"Carburised filaments and methods for treating the same." 19380/43. November 23rd, 1942. (574430.)

Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.).—"Electron devices of the magnetron type." 4165. March 28th, 1942. (574453.)

Standard Telephones & Cables, Ltd., and R. M. Barnard.—"Apparatus for determining distance by the reflection of electromagnetic waves." 6172. April 5th, 1940. (574319.)

Standard Telephones & Cables, Ltd., C. W. Earp and J. D. Weston.—"Receivers for radio navigational systems." 1156. January 20th, 1944. (574340.)

W. E. Stilwell, Jnr.—"Electric circuit breakers." 20592/43. December 5th, 1942. (574434.)

Sulzer Frères Soc. Anon.—"Gas turbine plants." 8506/44. May 8th, 1943. (574378.) "Blades for turbo-machines." 12085/44. July 31st, 1943. (574440.)

G. L. Woolnough and Metropolitan-Vickers Electrical Co., Ltd.—"Thermally-operated electric relays and switches." 65. January 3rd, 1944. (574372.)

K. M. B. Wright and Ionic Laboratories, Ltd.—"Device for use in calculating electrical values." 1407. January 25th, 1944. (574345.)

TRADE MARKS

THE following applications have been made for the registration of trade marks. Objections may be entered within a month from the dates indicated:—

January 9th.

TELECRYPTON. No. 636,442, Class 9. Telegraph signal scrambling and unscrambling apparatus. Also TELEFAX. No. 636,443, Class 9. Telegraph facsimile transmitting and recording apparatus.—Creed & Co., Ltd., Telegraph House, Cherry Orchard Road, Croydon.

PYVEX. No. 636,081, Class 17. Electrical insulating material in the form of strip, tape, tube or sleeving; electric insulators, insulation parts, all being goods not made of glass; and insulating gloves.—Veedip, Ltd., St. Helens Works, Liverpool Road, Trading Estate, Slough.

January 16th.

PILLAR-OF-FIRE (design). No. B634,083, Class 9. Luminous or illuminated road traffic signs and boundary marking pillars.—The Cardiff Foundry & Engineering Co., Ltd., Hurman St., Cardiff.

G. MARCONI (design). No. 634,909, Class 9. Electrical apparatus and instruments not included in other classes, but not including wireless or television receiving sets or loudspeakers for use in wireless broadcast reception by the public or electrical public address apparatus.—Marconi's Wireless Telegraph Co., Ltd., Electra House, Victoria Embankment, London, W.C.2.

DIFFUSALUX. No. 636,918, Class 11. Electric lighting apparatus and appliances.—Thorn Electrical Industries, Ltd., 105 to 109, Judd St., London, W.C.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Aberdare.—February 18th. Electricity and Transport Department. 3-kV switchgear. (See this issue.)

Bexley.—February 11th. Electricity Department. Paper-insulated underground cables. (See this issue.)

Birkenhead.—February 18th. Electricity Department. Supply of electric lamps for twelve months. (See this issue.)

Cheadle and Gatley.—February 11th. Electricity Department. Cables, lamps and meters. (See this issue.)

Delhi.—March 15th. Delhi Central Electric Power Authority. Switchgear and transformers. (See this issue.)

Dumfries.—February 10th. Electricity Department. One 300-kVA and two 500-kVA transformers. (January 18th.)

Great Yarmouth.—February 1st. Electricity Department. Supply and delivery of domestic appliances and installation materials. (January 18th.)

Kensington.—February 12th. Borough Council. Electrical goods (cables, flexibles, tapes, conduits, fittings and accessories), for twelve months. Particulars from the town clerk, Town Hall, W.8.

Kettering.—February 23rd. Electricity Department. Supply, delivery and erection of cast-iron pipes and headers to recondition two economisers. (See this issue.)

Leeds.—February 8th. Transport Committee. Supply and erection of 3,000-kW automatic mercury arc rectifier equipment, complete with switchgear. (January 11th.)

Norwich.—February 12th. Electricity Department. Ripple control equipment. (See this issue.)

Skelton & Brotton.—February 19th. Electricity Department. Wash-boilers, cookers, lighting columns and lanterns. (See this issue.)

Southend-on-Sea.—February 7th. Electricity Department. Meters. (January 18th.)

February 28th. Electricity Department. Electrode boiler plant, etc., for the Hot Sea Baths Establishment. (See this issue.)

Stoke-on-Trent.—January 29th. North-West Midlands J.E.A. Mains and cables and overhead lines and services. (January 11th.)

Sunderland.—February 11th. Council. Electrical installations on the Springwell Farm estate. (See this issue.)

Orders Placed

Camberwell.—Works Committee. Recommended. Electricity installation at Glangall wharf (£61).—County of London Electric Supply Co.

Salford.—Light, Heat & Power Committee. Accepted. 100 standard domestic consumers' service units from each of the following companies.—Revo Electric Co. and British Insulated Callender's Cables.

Sheffield.—Corporation. Accepted. 20-MVA self-cooled transformer for Neepsend generating station (£15,487).—English Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Andover.—Permanent houses (26), Farrs Avenue, for T.C.; R. S. Offord, borough surveyor, municipal offices, Bridge Street.

Bedford.—Houses (178), Cardington Road and Mile Road (100); borough engineer.

Extensions, Lynton works, Ampthill Road; W. H. A. Robertson & Co., Ltd.

Bedfordshire.—Canteen and classrooms, Sundon Park School, Sundon (£5,120); H. Lacey & Sons (Builders), Ltd., Hazelbury Crescent, Luton.

Billericay.—Community centres at Billericay, Wickford, Laindon and Pitsea, for U.D.C.; surveyor, Council offices, High Street.

Blaydon-on-Tyne.—Houses (36), Rowlands Gill; U.D.C. surveyor.

Blyth.—Pithead baths, Crofton Pit; Miners' Welfare Commission, London, S.W.1.

Bournemouth.—Works and offices, Haviland Road; Southampton Bedding Works, Ltd.

Bristol.—Crematorium, Canford Park, Westbury-on-Trym (£65,000); borough engineer, 7, College Fields, Clifton.

Bromsgrove.—Cinema, for Essanbee, Ltd.; Harold S. Scott, architect, King's Court, 115, Colmore Row Birmingham.

Builth Wells.—Permanent houses (40), Lion Field, for U.D.C.; J. Owen Parry and Lewis, architects, Arcade Chambers, Ammanford.

Canterbury.—Maternity unit, Canterbury Hospital (£10,000); city surveyor, Municipal Buildings.

Carlisle.—Factory for Smith & Co., Ltd.; W. R. Jeffrey, architect, Bank Street.

Caterham & Warlingham.—Permanent houses (44), for U.D.C.; surveyor, Council offices.

Coalville.—Factory, Central Road; Kimberlin, Brown & Co., Ltd., Kaybee House, Charles Street, Leicester.

Corby.—Factory, Lloyds Road; William Green & Sons, Ltd., Rushden.

Coulsdon & Purley.—Permanent houses (100), Limpsfield Road, Sanderstead (£109,909), for U.D.C.; J. Cartwright, Ltd., builders, King's Avenue, London, S.W.4.

Dartford.—Houses (78), Princes Road; borough engineer.

Extensions, Priory works, Kingsfield Terrace; J. & E. Hall, Ltd.

Ealing.—Houses (240), South East Northolt estate (£316,913), for T.C.; Davis Contractors, Ltd., builders.

Eastleigh.—Permanent houses (89), Chestnut Avenue; J. C. Gardner, town clerk, Town Hall.

Feltham.—Houses (300), South Bedfont, for U.D.C.; J. S. Syrett, clerk, Council offices.

Godmanchester.—Permanent houses (52), Grove estate; F. G. Lane, borough surveyor, Town Hall.

Ilford.—Permanent houses (50), Oaks Lane and Colvin Gardens; L. E. J. Reynolds,borough engineer, Town Hall.

King's Lynn.—Houses (20), and 12 flats, Gaywood Hall Estate (£31,919); Jaques & Greeves, builders, 28, Springfield Lane, Doncaster.

Kingswood (Bristol).—Permanent houses (75), for U.D.C.; G. Fletcher, Council offices.

Leeds.—Houses (166), Chelwood Estate; S. & N. Shute, Ltd., builders, Street Lane.

Leek.—Permanent houses (264), various sites, for U.D.C.; John A. Gilchrist, surveyor, Town Hall.

Manchester.—Clothing factory, 151, Plymouth Grove; H. B. Swales, 5, Gore Street.

Works extensions; Manchester Oxide Co., Ltd., Canal Street, Miles Platting.

Midsomer Norton.—Factory, Station Road; Welton Bag Co., Ltd.

Moxley (Wednesbury).—Nurses' home (£7,000); West Midlands Joint Hospital Board.

Newcastle-on-Tyne.—Houses (24), Netherby Drive; C. S. Hogg, builder, Netherby Drive.

Newmarket.—Houses (42), for R.D.C.; L. I. Cockerham, architect, Council offices, Park Lane.

Northamptonshire.—Additions, Creston Sanatorium (£50,000); county architect, County offices, Guildhall Street.

North Shields.—Factory, Tynemouth Trading Estate, for Dukes & Marcus, dress manufacturers, Kendal.

Oswestry.—Factory and offices, Insulation Equipments, Ltd.; S. Fox Davies, architect.

Penzance.—Houses (60), Treneere estate; D. J. Beattie, town clerk, Municipal Buildings.

Pontefract.—Houses (294), Chequerfield estate (£327,000); W. H. Young (Ashfield), Ltd., and Gibson Bros (Upton), Ltd.

Prudhoe-on-Tyne.—Houses (50), Castle Dene; U.D.C. surveyor.

Redcar.—Houses (200); borough engineer.

Reigate.—Houses (96) (£121,620); E. S. Moss, Ltd., builders, Hendon.

Richmond (Yorks).—Permanent houses (48), Eastfield Avenue; H. D. Stanworth, borough engineer, Corporation offices.

Royston (Yorks).—Houses (50); U.D.C. surveyor.

Scunthorpe.—Houses (124), Lincoln Gardens estate; Buttrick & Buttrick, architects, 43, Oswald Road.

Shipley. Houses (50), Crag Road and West Roys, for U.D.C.; H. Dawson, surveyor, Town Hall.

Southborough.—Permanent houses (50), Manor Road site, for U.D.C.; Howes & Jackman, architects, 1, Verulam Buildings, Gray's Inn, London, W.C.1.

Southgate.—Houses (76), Barrowell Green, N.21; J. T. W. Peat, borough engineer, Town Hall, Palmers Green, N.13.

Southwell.—Houses (64) Blidworth and Farnsfield, for R.D.C.; S. Cooper, surveyor, 8, Westgate.

Stafford.—Lecture hall, Central Library (£7,000); T. A. Higson, borough surveyor, Borough Hall.

Thetford.—Houses (40); Hunt & Coates, architects, 84 Guildhall Street, Bury St. Edmunds.

Walsingham.—Permanent houses (90), for R.D.C.; housing officer, 10, The Square, Fakenham, Norfolk.

Wanstead & Woodford.—Houses (100), Woodford Green (£108,866); Allen Fairhead & Sons, Ltd., builders, Sydney Road, Enfield.

West Bromwich.—Houses (52); Edgar Crowder, builders, South Road, Handsworth, Birmingham.

Widnes.—Houses (166), Lower House Lane (£172,229); Leyland Construction Co., Ltd., Leyland, Lancs.

Wolverton.—Permanent houses (30), New Bradwell, for U.D.C.; G. A. Jellicoe, architect, 12, Gower Street, London, W.C.1.

Nationalisation in France

Combination of Gas and Electricity

PROPOSALS for the nationalisation of the gas and electricity supply industries of France are embodied in a Bill presented to the National Assembly last week. The whole of the 2,400 concerns producing and distributing gas and electricity are to be brought under an organisation to be called Electricité et Gaz de France which will have the overall control of a number of regional organisations. In the acquisition of the companies' assets special measures will be introduced for dealing with those whose capital is held outside France.

According to Monsieur Marcel Paul, the Minister of Industrial Production, the Government's principal aims are the modernisation of plant and particularly the extensive development of water power to reduce the need for imported coal. The present annual hydro-electric production is only about 13,000 million kWh, whereas there are resources capable of raising the total to 40,000 million kWh. Monsieur Paul made special reference to the development of the Rhône. Monsieur Paul assured the Assembly that local autonomy will be granted in generous measure.

The new organisation will control all production and distribution of electricity and gas, but will leave the installation of domestic and industrial equipment to private enterprise.

A public loan will be floated to finance the scheme and compensation is to be based on the average market value of the undertakings between September, 1944, and August, 1945, in no case falling below the figures prevailing in June, 1945. Compensation will take the form of shares in Electricité et Gaz de France bearing a 3 per cent. dividend.